The Victorian Naturalist

The Magazine of the
FIELD NATURALISTS CLUB OF VICTORIA

in which is incorporated
THE MICROSCOPICAL SOCIETY OF VICTORIA

Vol. 96

January–December, 1979

COMPILED BY JAMES A. BAINES

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Field Naturalists Club of Victoria Centenary 1880-1980

CALENDAR OF EVENTS

March-December 1980

Supplement to *The Victorian Naturalist* Jan/Feb 1980

FNCV Calendar of Events 1980

Special Centenary events are indicated by bold type

MARCH

Sun 2. General and Geology Group Excursion to FNCV Kinglake property; Leader Mr Graeme Love on "Fingerprints of minerals"

Mon 3. Marine Biology & Entomology Group: Dr Brian Smith on "Evolution of molluscs".

Tues 4. Mammal Survey Group: Introductory talk — field identification of mammals.

Wed 5. Geology Group: Mr I Robinson on "Seismology".

Sat-Mon 8-10, Labour Day Weekend. Annual Meeting and camp of Victorian Field Naturalist Clubs Association at Benalla.
Mammal Survey camp at Strathbogie.

Thurs 13. Botany Group: Mr Bruce Fuhrer on "A trip through the Big Desert".

Sat-Sun 15-16. Special Study Trip: Reptiles, Baw Baw/Tanjil Bren.

Mon 17. General Meeting: programme hosted by the Geology Group.

Wed 19. Microscopy Group: Introduction to the microscope with display of various types.

Thurs 20. Day Group: Blessington Gardens, St Kilda.

Sat 22. Botany Group Excursion to Mt Macedon re trees; Leader Miss Pat Carolan.

APRIL

Special FNCV display at the National Museum to begin during this month and to continue for several weeks.

Tues 1. Mammal Survey Group: Introductory talk on identification of Bandicoots.

Wed 2. Geology Group: Antimony.

Fri-Tues 4-8, Easter. Camp at Strathbogie of Hawthorn Juniors; all FNCV members welcome.
Mammal Survey camp at Strathbogie.

Thurs 10. Botany Group: Mr Bleakley on "Australian Alpine Flora".

Sun 13. Geology Group Excursion to Mt Robertson for trilobites.

Mon 14. General Meeting: Dr Barry Wilson, Director of National Museum, on "Aspects of Marine Life".

Wed 16. Microscopy Group: Methods of lighting objects for micro examination.

Thurs 17. Day Group: "Puffing Billy" to Emerald.

Sat 19. Special Study Trip: Birds, Lerderderg Gorge.

Sat 26. Botany Group Excursion to Coranderrk area near Healesville.

MAY

Sun 4. Centenary Picnic at Bruce's Creek, Whittlesea.

Mon 5. Centenary Meeting at the State Film Centre to be opened by the State Governor Sir Henry Winneke, patron of the FNCV. The speaker will be Dr J H Willis.

Tues 6. Mammal Survey Group. Identification of Kangaroos — new method.

Wed 7. Geology Group: Occurrence and use of Phosphate.

Thurs 8. Botany Group: Dr Elizabeth Turner on "Natural history of the Kwangsi area of Southern China.

Sat-Sun 10-11. Mammal Survey Camp at Buxton.

Sun 11. Geology Group Excursion to Spring Gully, Bendigo.

Mon 12. Annual General Meeting: programme hosted by the Botany Group.

Thurs 15. Day Group: Carlton walk.

Sun 18. Special Study Trip: Cryptozoic life in Toolangi Forest.

Wed 21. Microscopy Group: Simple methods of mounting objects for micro examination.

Sat 31. Botany Group Excursion to Upper Packenham for ferns and fungi.

JUNE

Sun 1. General Excursion to Doon Galla Estate.

Mon 2. Marine Biology & Entomology Group: Mr Peter Kelly on "Revision of the beetle genus Paropsis".

Tues 3. Mammal Survey Group: Film night.

Wed 4. Geology Group: Prof E Sherbon Hills will be the speaker.

Mon 9. General Meeting: programme hosted by Microscopy Group.

Thurs 12. Botany Group: Dr J H Willis on "Fungi in Victoria".

Sat-Mon 14-16, Queen's Birthday Weekend: Mammal Survey camp at Eildon.

Wed 18. Microscopy Group: Use of various mountants in preparing micro slides.

Note: Programmes may be changed at short notice; please check w

Thurs 19. Day Group: Coburg Park Lake Reserve.
Sat-Sun 21-22. Special Study Trip: Mammals, area to be announced.
Sat 28. Botany Group Excursion to Kinglake FNCV property for fungi.

JULY

Tues 1. Mammal Survey Group: Identification of Pigmy Possums.
Wed 2. Geology Group: Dr Andrew Prentice on "The Solar System".
Sun 6. General Excursion: Leader Mr Graeme Love on "Building stones of the city".
Mon 7. Marine Biology & Entomology Group: Mr Peter Carwardine on "How to identify Insect Larvae".
Thurs 10. Botany Group: to be announced.
Sat-Sun 12-13. Mammal Survey Group.
Mon 14. General Meeting: Dr D M Churchill, Director of National Herbarium, on "Co-operation of the Herbarium with layman botanists".
Wed 16. Microscopy Group: Pond and Marine microscopic life.
Thurs 17. Day Group: Ancient Times House, Little Bourke Street.
Sat 19. Special Study Group: Fungi and forest vegetation, Buxton area.
Sat 26. Botany Group Excursion to the Dandenongs.
Sun 27. All Day Symposium at Rusden State College on "Effects of introduced plants and animals".

AUGUST

Sun 3. General Excursion to Pound Bend and Jumping Creek Reserve with leader Mr Ian Morrison.
Mon 4. Marine Biology & Entomology Group: Mrs Zillah Lee on "Natural history of some Wasps".
Tues 5. Mammal Survey Group: subject to be announced.
Wed 6. Geology Group: Dr Chris Gray, subject to be announced.
Sat-Sun 9-10. Mammal Survey Camp.
Mon 11. General Meeting: programme hosted by Mammal Survey Group; Mr Bob Warneke of Arthur Rylah Research Institute on "Forest Mammals Research Units".
Thurs 14. Botany Group: Mr Ian Morrison on "Flora of the Grampians".
Sun 17. Special Study Trip: Cathedral Range for geology and vegetation type in comparison with Buxton.
Wed 20. Microscopy Group: Botanical section cutting, straining and mounting.
Thurs 21. Day Group: Cheltenham.
Sat 30. Botany Group Excursion to Lysterfield area for wattles.

SEPTEMBER

Mon 1. Marine Biology & Entomology Group: Mr Urwin Bates on "Galls and gall insects".
Tues 2. Mammal Survey Group: an introductory talk, subject to be announced.
Wed 3. Geology Group: Mr M Garrett on "Palaeontology".
Sun 7. General Excursion to Mornington Peninsula with leaders from Botony Group.
Mon 8. General Meeting: Speaker will be Mr Don Saunders, Director of National Parks.
Thurs 11. Botany Group: Mr Leon Costermans will be the speaker.
Sat-Sun 13-14. Mammal Survey Camp.
Wed 17. Microscopy Group: Polarised light and the interference microscope.
Thurs 18. Day Group: Wattle Park.
Sat-Sun 20-21. Special Study Trip: Botany of coastal heathlands, Angahook Forest.
Sat 27. Botany Group Excursion to Antonio Park, Mitcham, and nearby areas.

OCTOBER

Wed 1. Geology Group: hopefully the speaker will be Mr A Goad (Arts Centre Contractual Engineer).
Sun 5. General Excursion to Bendigo Whipstick with leader Mr Frank Robbins.
Mon 6. Marine Biology & Entomology Group: Mr David Harbeck on "Insect fruit pests".
Tues 7. Mammal Survey Group: Mammals of Wilsons Promontory.
Fri-Sun 10-12. Centenary Nature Show at the Lower Melbourne Town Hall.
Mon 13. General Meeting: Wilsons Promontory study evening by the Study Groups.
Wed 15. Microscopy Group: Photography through the microscope.
Thurs 16. Day Group: Blackburn Lake.
Sat 18. Special Study Trip: Effects of Phytopthora (cinnamon fungus), Brisbane Ranges.
Sat 25. Botany Group Excursion to Langwarrin and Cribb Point.
Wed 29. Mammal Survey Group's November meeting; subject to be announced.

th the latest *Naturalist* or phone the relevant number as listed overleaf

NOVEMBER

Sat-Sat 1-8. Centenary Camp at Wilsons Promontory.

No meetings of Marine Biology & Entomology, Mammal Survey, and Geology Groups because of the Centenary Camp.

Mon 10. General Meeting: Speaker will be the winner of 1980 Natural History Medallion.

Thurs 13. Botany Group: Miss Madge Lester on "Plants of costal sand dunes".

Wed 19. Microscopy Group: Movie photography through the microscope.

Thurs 20. Day Group: Altona Beach.

Sat 29. Botony Group Excursion to Gembrook and Beenak.

DECEMBER

Mon 1. Marine Biology & Entomology Group: ABC meeting, supper.

Tues 2. Mammal Survey Group: Discussion and preparations for Christmas camp.

Wed 3. Geology Group: Members' Night.

Sun 7. General Excursion to Anglesea.

Mon 8. General Meeting: Programme hosted by Hawthorn Junior FNC.

Thurs 11. Botany Group: to be announced.

No meetings of the Microscopy Group and Day Group in December.

Fri 26 continuing for 7-10 days. Mammal Survey Camp, high plains in East Gippsland.

Location of FNCV General Meetings and FNCV Study Group Meetings
Each meeting occurs once a month

General Meetings: National Herbarium, The Domain, South Yarra; second Monday.

Botany Group: National Herbarium, The Domain, South Yarra; second Thursday.

Day Group: No evening meetings, different meeting place each month; third Thursday.

Geology Group: National Herbarium, The Domain, South Yarra; first Wednesday.

Mammal Survey Group: National Herbarium, The Domain, South Yarra; first Tuesday.

Marine Biology & Entomology Group: Conference Room, National Museum, enter from Latrobe St, parking in court; first Monday.

Microscopy Group: National Herbarium, The Domain, South Yarra; third Wednesday.

All evening meetings commence at 8.00pm and continue to 10.00pm.

Other regular events:

General Excursions are on the first Sunday.

Special Study Trips are on third weekend in the sequence Saturday, Saturday-Sunday camp, Sunday.

Botany Group excursions on last Saturday.

Mammal Survey camps on second weekend or on long holiday weekend.

For further information please phone the relevant number

FNCV Secretary 859 8091.
Gen Excursions 527 2749.
Spec Sty Trips 859 8091.

Botany Group 557 6045.
Day Group 578 1879.
Geology 697 6596 (bus.hrs).

Mammal Survey 874 4408.
Marine Bio & Ento 211 2427.
Micro Group 211 2427.

victorian naturalist

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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 11 February, 8.00 p.m.
Speaker: Dr. Martin Gomon, Curator of Fishes, National Museum of Victoria.
Subject: Fish Research in Victoria.

Monday, 17 March, 8.00 p.m. (Note meeting a week late due to holiday)
Special Study Meeting to be hosted by the Geology Group.
Topic to be arranged.

Monday, 14 April, 8.00 p.m.
Speaker: Dr B.R. Wilson, Director, National Museum of Victoria.
Subject: Aspects of Marine Life.
(This is one of the special meetings of this Centenary Year).

Advance Notice

Monday, 5 May — CENTENARY MEETING
State Film Centre, 1 MacArthur Street.
In the presence of Sir Henry and Lady Winneke.
Speaker: Dr J.H. Willis.
(Note: As demand for seats may be greater than the number available some form of allocation may be necessary.
Special arrangements for this appear on p.42).

New Members — January/February General Meetings

Ordinary:
Mr R. Vagi, 6 Beryl Street, Burwood.
Mr R. Murray, 20 Essex Road, Surrey Hills.
Mr J. Grusovin, 46 Leigh Street, Oakleigh.

Country:
Mr P. Rolley, "Wirralea", Ducks Lane, Seville.
Mr E. Peters, 32 Hunter Street, Castlemaine.

Joint:
Mr & Mrs R.A. Moon, 28 Fahey Crescent, Macleod.

FNCV EXCURSIONS

Sunday, 2 March. Kinglake. Field identification of minerals with the Geology Group. There will be a display of minerals at the Kinglake Block, and Mr G. Love will explain "Fingerprints of minerals" for the layman. The coach will leave Batman Avenue at 9.30 a.m. Fare $5.00. Bring a picnic lunch. Members going by car should be at the Block by 11.30 a.m.

Saturday, 8 March — Monday, 10 March. Labour Day Weekend. Benalla. This is the annual gathering of the Victorian Field Naturalists Clubs Association, hosted this year by the Benalla F.N.C. There will be meetings on Saturday and Sunday evenings, and excursions on Saturday, Sunday and Monday mornings. The former army camp (now Council owned) will be the venue for the meetings and the starting place for excursions. Members may camp in the buildings for $1.00 per night. Sleeping gear will be required as there are no beds, but facilities are good with stoves, cool room, chairs, tables, etc. Eating and cooking utensils should be taken. There is room for caravans, and some motel accommodation has been reserved for members not wishing to camp. Camp and motel are available on Friday night. At present it is proposed to use private cars or go by train, but a coach could be chartered if sufficient members desired it. Please let the Excursion Secretary know at once if you are going and if you need motel accommodation.

Friday, 4 April — Tuesday, 8 April. Easter. Strathbogie campout organized by the Hawthorn Junior F.N.C. All members are welcome and there may be a few seats on the coach, which will leave McKenzies, 53 Barkers Road, Kew, at 8.00 a.m. Friday. For bookings and details contact Miss Rosalind St Clair, 4 Westgarth Street, East Malvern. Phone 509 2621.

Sunday, 4 May. Centenary picnic — Bruce's Creek, on the property of Mr Alan Parker. This adjoins State forest with good walks, and is next to a scout camp, the buildings of which will be available if the weather is bad. There is scope for the active but also an opportunity for

(Continued on page 42)

- 9 SEP 1987

The Victorian Naturalist

Volume 97, Number 1 January/February, 1980

Centenary Year 1880 — 1980

Editor: Robert L. Wallis
Editorial Committee: H. Cohn, M. Corrick, R. Kent, B. Smith

Cover illustration: Differences in coat colour between *M. fuliginosus* (left) and *M. giganteus* (right). Note particularly the darker face in *M. fuliginosus*. Photograph taken at the Royal Melbourne Zoological Gardens.

Extension of Range of the Western Grey Kangaroo, *Macropus fuliginosus*, in Victoria

By G. M. Coulson*

Identification

The two species of grey kangaroo inhabit areas of forest or woodland, and are often observed feeding in adjacent open areas. Both the eastern grey, *Macropus giganteus*, and the western grey, *Macropus fuliginosus*, occur in Victoria, with a narrow zone of sympatry extending southwards from the Swan Hill area into the Grampians Ranges, then westwards into south-eastern South Australia (Figure 1). These closely related species cannot be distinguished by skeletal characteristics, but may be separated on the basis of criteria such as length of oestrous cycle and of gestation period, hair follicle density and blood serum proteins (Kirsch and Poole, 1972). An experienced observer can identify animals in the field by their coat colour: eastern greys range from silver-grey to grey-brown whereas western greys are a darker chocolate-brown with a dark brown to black face and ears (see cover illustration).

Extension of Range

The discovery near Inglewood, central Victoria, of two specimens of the western grey kangaroo represents an eastward extension of approximately 100 km of the known range of this species (Figure 1). Both specimens were road kills found by the author. They were lodged with the National Museum of Victoria and their identity was confirmed by W. E. Poole, CSIRO Wildlife Research, Canberra. The first specimen (C17186), a female, was collected on 27/7/77 approximately 5 km south-west of Inglewood on the main Kingower road (36°30′36′′ S, 143°40′55′′ E). The southern side of the road was cleared farmland while the vegetation to the north was a woodland of yellow gum, *Eucalyptus leucoxylon*, and grey box, *E. microcarpa*, with an understorey predominantly of gold-dust wattle, *Acacia acinacea*, golden wattle, *A. pycnantha*, and Chinese scrub, *Cassinia arcuata*. The second specimen (C22281), also a female, was collected on 13/4/79 about 9 km south-west of Inglewood on the same road (36°30′40′′ S, 143°40′39′′ E). The pouch contained a naked young with a pes length of 3.4 cm. Vegetation on both sides of the road was a woodland/open forest of yellow gum, *E. leucoxylon*, grey box, *E. microcarpa*, and red ironbark, *E. sideroxylon*, with an understorey of such shrubs as golden wattle, *A. pycnantha*, spreading wattle, *A. diffusa*, Chinese scrub, *C. arcuata* and flame heath, *Styphelia behrii*. A brief survey in September 1979 located eleven individuals of *M. fuliginosus* feeding at dusk in cleared farmland about 3 km north of the localities of the specimens collected (Figure 1). To date the eastern grey kangaroo has not been observed in the Inglewood area. The only other large macropod sighted is the black or swamp wallaby, *Wallabia bicolor*.

Distribution

Kirsch and Poole (1972) noted that the distribution of *M. fuliginosus* follows closely that of mallee associations in Victoria and New South Wales. Although Inglewood is surrounded by discontinuous areas of mallee, *M. fuliginosus* has not yet been positively identified within any of these areas and is clearly not confined to them. Without detailed knowledge of the species' habitat requirements it is difficult to delineate the probable limits to its distribution. However, the absence of

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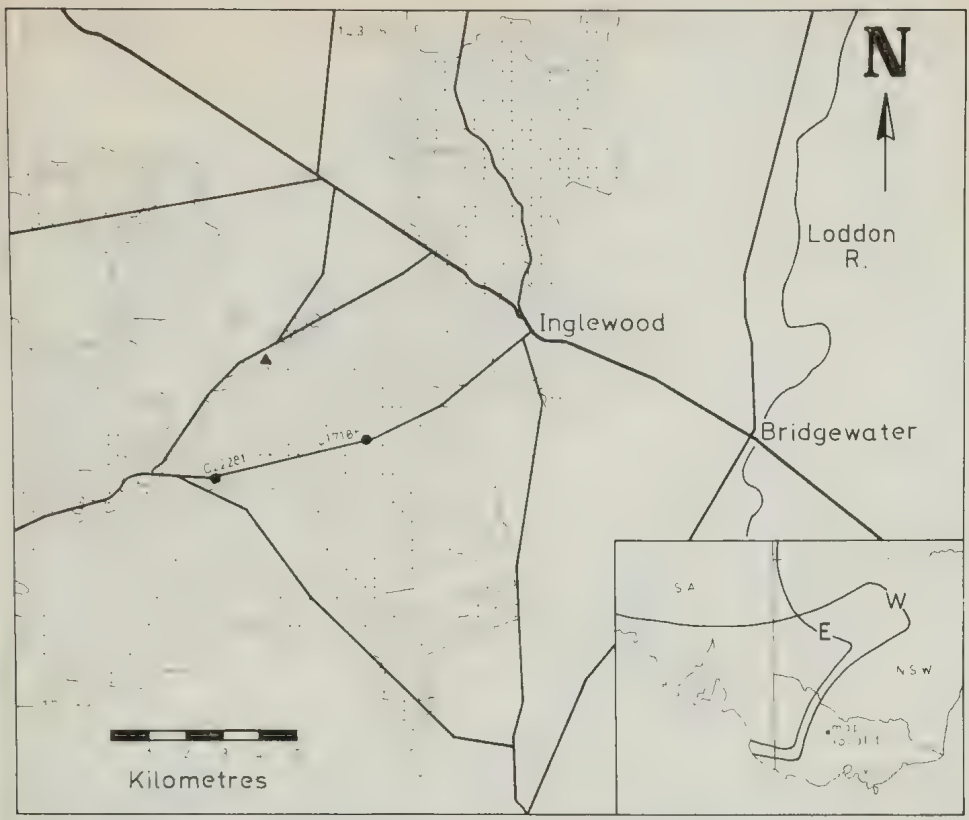

Fig. 1. Map of the Inglewood area, central Victoria. Stippling indicates areas of woodland and forest. Localities of museum specimens of *M. fuliginosus* are shown by circles; the triangle indicates sightings of *M. fuliginosus*. The inset shows the map locality and the presumed limits of the range of *M. giganteus* (E) and *M. fuliginosus* (W) after Kirsch and Poole (1972).

any sizeable stands of woodland or forest for some distance to the east of Inglewood (Figure 1) suggests that *M. fuliginosus* is unlikely to extend beyond the Loddon River, except perhaps near its junction with the Murray River at Swan Hill. There are substantial areas of apparently suitable habitat south of Inglewood, but the extent of distribution in this direction is unknown.

Surveys of distribution are being continued; the author would be grateful for any information about grey kangaroo populations in this area.

REFERENCES

Kirsch, J. A. W. and Poole, W. E. (1972). Taxonomy and distribution of the grey kangaroos *Macropus giganteus* Shaw and *Macropus fuliginosus* (Desmarest) and their subspecies (Marsupialia: Macropodidae). *Aust. J. Zool.* **20:** 315-339.

Poole, W. E. (1977). The eastern grey kangaroo, *Macropus giganteus*, in south-east South Australia: its limited distribution and need of conservation. *CSIRO Div. Wildl. Res. Tech. Pap. No. 31.*

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The new subscription rates for 1980 are printed on the back page of this issue. Please assist the Club by posting your sub. straight away to the Subscription Sect. **Mr K. Koth, 21 Smart St., Hawthorn 3122, Vic.**

The Breeding Seasons of Frogs in Victoria and Tasmania

BY A. J. BROOK*

Introduction

Although Littlejohn and Martin (1974) summarized data on breeding seasons for frogs in Tasmania, no similar summary has been published for frogs in Victoria. This paper presents all available information on breeding seasons to the end of 1978, for both Tasmanian and Victorian frogs.

Methods

Most data were obtained from the field notes of Dr M. J. Littlejohn, Dr A. A. Martin, Dr G. F. Watson and Mr A. J. Brook of the Department of Zoology, University of Melbourne, with some additional information from Dr D. F. Gartside, Mr P. A. Rawlinson and Mr R. H. Green. Literature references with breeding season information were Blanchard (1929), Littlejohn (1963a, 1963b), Littlejohn and Martin (1964, 1967), Martin (1965, 1967a, 1972), Martin and Littlejohn (1966), Watson, Loftus-Hills and Littlejohn (1971) and Woodruff (1972).

Three types of data were collected: presence of egg masses, observations of amplexus, and voice records. Records of egg masses and vocalizations have been used only where species-specific, or where only one species with the particular type of egg mass or characteristic call was known to occur.

Two subjectively-determined classes of vocal activity were recognized: (a) chorus-calling — vocal activity by a group of conspecific frogs calling in close proximity, and between which there appeared to be behavioural interdependence; and (b) non-chorus calling — spasmodic calling by a few, scattered individuals, between which there was little or no obvious interaction.

*Department of Zoology, University of Melbourne.

Species Identification and Nomenclature

Species identification and nomenclature is based on the arrangement of Barker and Grigg (1977), except for *Neobatrachus*. Roberts (1978) has redefined *Neobatrachus pictus*, so that the species of the *Neobatrachus* occurring in the north-west of Victoria, previously known as *N. centralis*, is now *N. pictus*, and the wide-spread species previously referred to as *N. pictus*, is now *N. sudelli* (Brook, 1979a).

Results

The data on breeding seasons are summarised in Figures 1 and 2.

Discussion

(i) Interpretation of Data

In general, egg — mass records are reliable, direct evidence of recent breeding activity, because for most species egg masses rarely last longer than one or two weeks before hatching. However, egg masses of the genera *Pseudophryne* and *Geocrinia*, which are laid on land, may remain viable for up to three months (Martin, 1967b), and cannot be used to indicate the duration of breeding unless specifically examined for developmental stages.

In this analysis, records of amplexus (mating) are treated as direct evidence of breeding activity because available evidence indicates that in most species, non-breeding females keep away from calling males, and only gravid females approach males and are likely to be amplexed.

Considerable caution was taken when relating voice records to the breeding season. Chorus calling may not indicate breeding activity, since such calling may proceed or extend beyond egglaying (unpublished observations). On the other

hand, in some species oviposition has been observed to be associated with non-chorus calling. Frogs of the Family Hylidae are noted for non-breeding calling activity (Bogert, 1960). For example, *Litoria verreauxi* (as *Hyla ewingi*, Harrison, 1922), *L. ewingi* (English, 1910) and *L. paraewingi* (unpublished observations) frequently utter calls when there is no breeding activity. Consequently, the total calling activity of a species must be well understood before voice records can be reliably used as evidence for the breeding season. Even so, for most species the duration of chorus calling appears to be a good indicator of the potential breeding season.

(ii) Completeness of Data

In Victoria, observations on vocal activity have been made systematically over most of the State during each month of the year. Consequently, except for species which occur in the far east

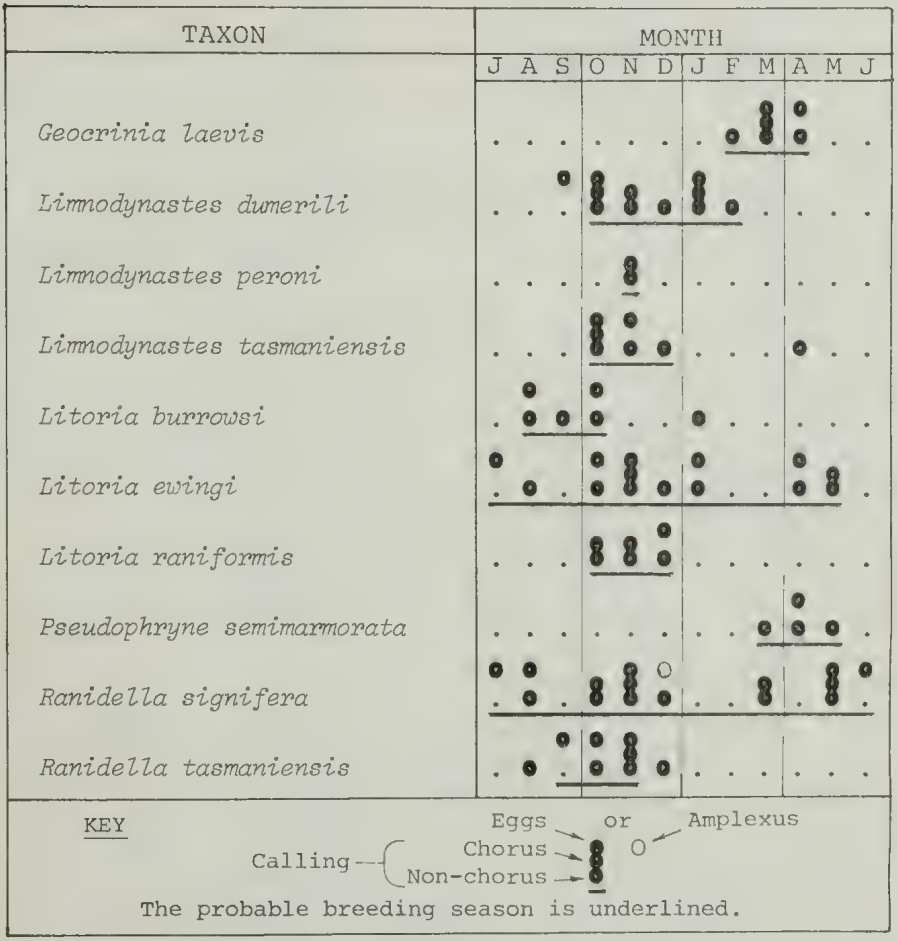
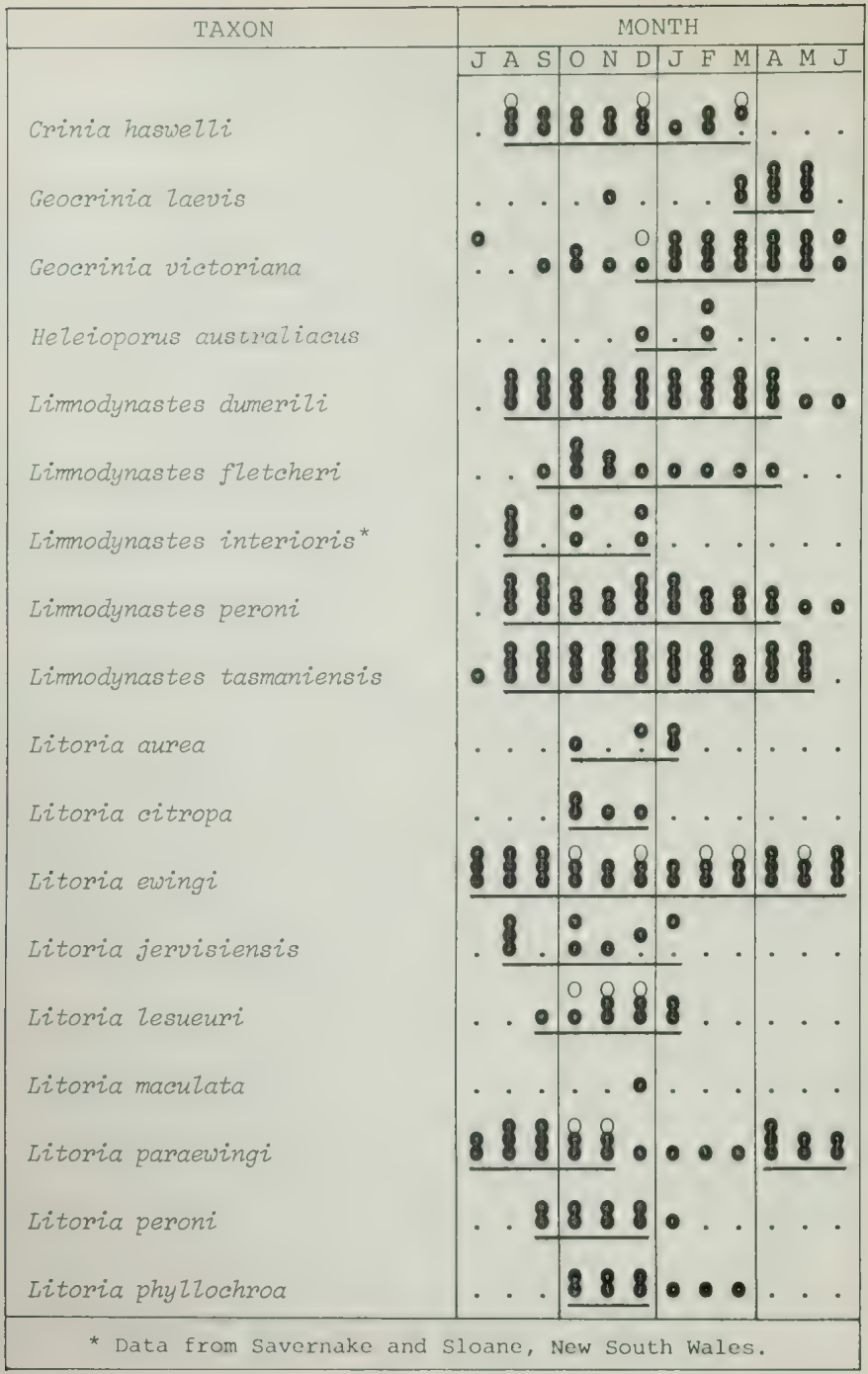
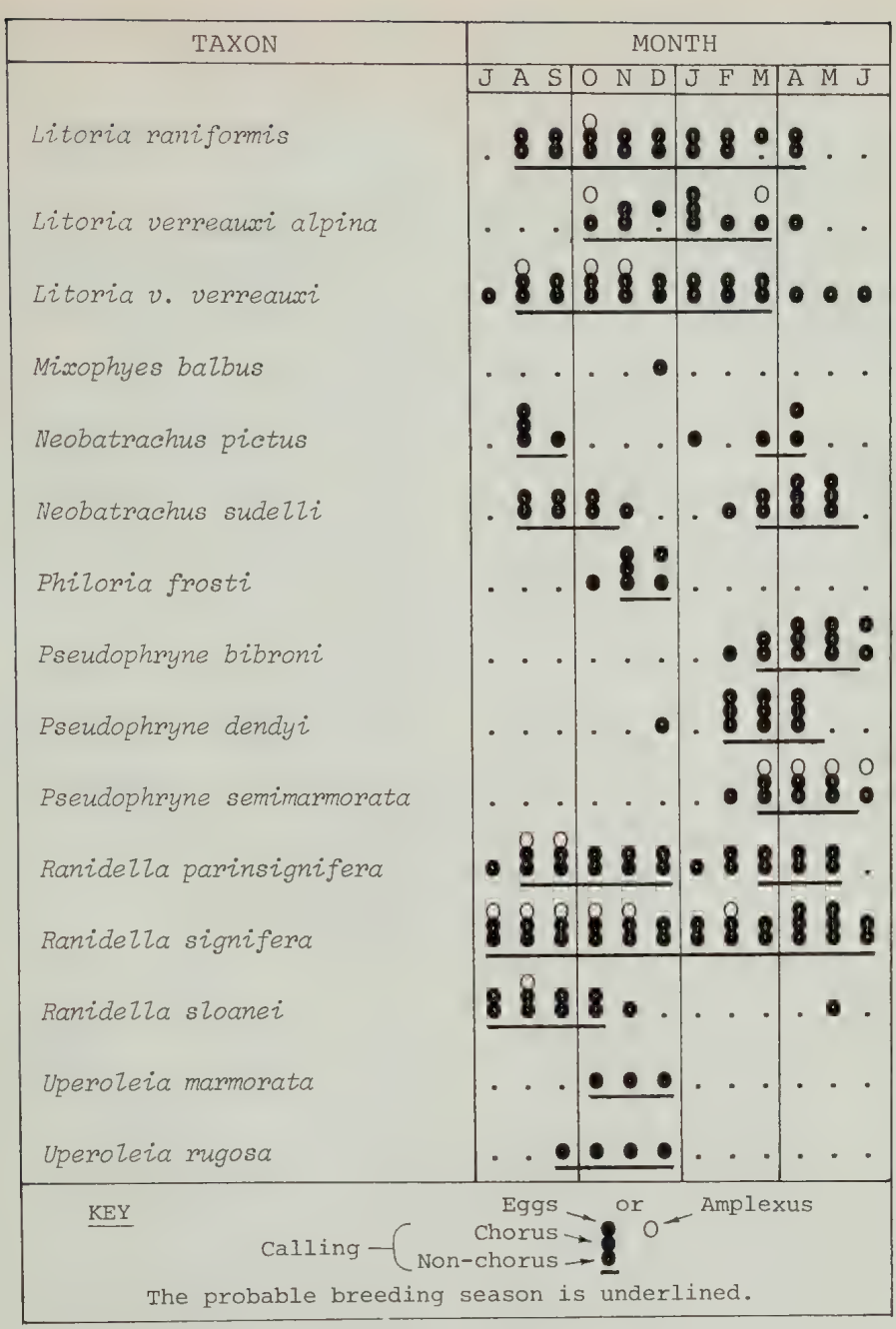


Fig. 1. Summary of seasonal breeding data for frogs in Tasmania (excluding Flinders and King Islands). Note that the annual monthly sequence commences in July.


TAXON
MONTH
J A S O N D J F M A M J
Crinia haswelli
Geocrinia laevis
Geocrinia victoriana
Heleioporus australiacus
Limnodynastes dumerili
Limnodynastes fletcheri
Limnodynastes interioris*
Limnodynastes peroni
Limnodynastes tasmaniensis
Litoria aurea
Litoria citropa
Litoria ewingi
Litoria jervisiensis
Litoria lesueuri
Litoria maculata
Litoria paraewingi
Litoria peroni
Litoria phyllochroa
* Data from Savernake and Sloane, New South Wales.

(Fig. 2, Part 1)



(Fig. 2, Part 2)

Fig. 2. Summary of seasonal breeding data for frogs in Victoria. Note that the annual monthly sequence commences in July.

and north-west of Victoria, the observations on calling activity should be relatively complete. The potential completeness of records on amplexus, and particularly eggs, varies from species to species. For example, the entire range of *Litoria verreauxi verreauxi* in Victoria is sympatric with *L. ewingi* (Brook, 1975, 1979a), and since the egg masses of both species are identical (Martin, Littlejohn and Rawlinson, 1966), no egg masses of *L. verreauxi verreauxi* can be identified in Victoria for species — specific data unless oviposition is observed. On the other hand, the large floating egg masses of *Limnodynastes dumerili* are conspicuous and easily identified, and records appear complete.

The Tasmanian observations appear to be incomplete, even for voice records of common species. (Fig. 1).

(iii) Patterns and Variation in the Breeding Season

For most species in Victoria, the data in Figure 2, represent the maximum potential breeding season, and do not indicate the relative intensity of breeding activity nor seasonal and geographic variations. Although there are insufficient data for detailed analysis, generalizations based on the three classes of breeding pattern recognized by Littlejohn (1971) can be made:

(a) A short, regular breeding season which occurs about the same time each year and is confined to a 4-6 week period. *Geocrinia victoriana* at low altitudes, *G. laevis* and the three species of *Pseudophryne* breed during autumn. At high altitudes *G. victoriana* commences a shorter breeding season in summer (Littlejohn, 1971).

(b) A short, irregular breeding season which follows heavy rain and lasts only two to three days. *Neobatrachus pictus* breeds at any time of the year in South Australia (Roberts, 1978) and the same pattern is likely in Victoria. *Neobatrachus sudelli* may have short irregular breeding, but probably not during the winter months.

(c) An extended breeding season characterized by intermittent breeding activity over an extended period. In *Litoria ewingi, L. paraewingi* and *Ranidella signifera*, breeding commences with the first heavy rains of autumn and continues into the early summer. Extension into mid-summer may occur in south-eastern Victoria. Breeding activity follows rainfall associated with the regular movement of cold fronts over southern Victoria. The remaining species begin breeding late in winter or spring and continue through into summer, with a second peak in autumn for some species. Continuation of breeding through summer appears rare in western Victoria but may be common in south-eastern Victoria.

Both the short, regular breeding pattern and the extended breeding pattern occur in Tasmania. However, spring breeding apparently begins later, and autumn breeding ends earlier in Tasmania than in Victoria, presumably due to the lower temperatures associated with higher latitudes.

Acknowledgements

Much of the field work by M. J. Littlejohn, A. A. Martin and G. F. Watson was carried out with grants from the Society of the Sigma Xi, the Nuffield Foundation, the Australian Research Grants Committee (Grant 66/16172), and the University of Melbourne Standing Research Vote. The author was assisted by the Australian Biological Resources Study.

I am indebted to Dr A. A. Martin, Dr G. F. Watson and particularly Dr M. J. Littlejohn of the Department of Zoology, University of Melbourne, for permitting access to their field notes, for valuable assistance and continuous encouragement.

The manuscript was criticised by Dr Littlejohn, and typed by my wife, Mary.

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Survey of Fishes in the West Branch of the Tarwin River above Berrys Creek

BY P. D. JACKSON*

Introduction

Little is known about the distribution of native species of fish in Victorian inland waters. With man's increasing pressure on the aquatic environment the documentation of species present in particular waters is, as a first step towards formulating conservation measures, a matter of some urgency. The present paper documents the results of a fish survey of the west branch of the Tarwin River and its tributaries above its confluence with Berrys Creek. The work was carried out between 3 April and 10 May 1979.

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The west branch of the Tarwin rises at an altitude of about 500 m on the southern slopes of the Strzelecki Ranges in south-eastern Victoria and has a steep catchment. The survey area is mostly cleared farmland with only occasional isolated eucalypt forests; consequently the river is heavily silted.

The river has a mean width of 2 m and mean depth of 0.08 m in the headwaters and a mean width of 4 m and mean depth of 2 m just before its confluence with Berry's Creek.

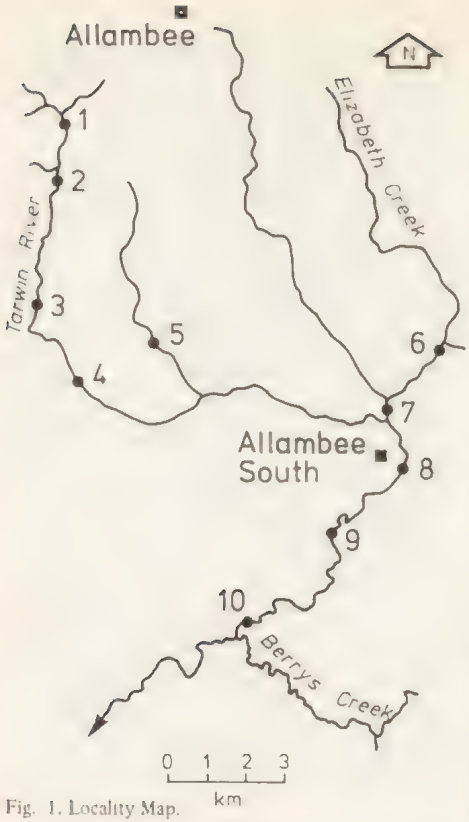

Fig. 1. Locality Map.

Materials and Methods

About 100 m of river at each of the 10 sampling stations (Fig. 1) was fished with a pulsed D.C. electrofisher. All fish captured were identified, anaesthetised with quinaldine, and measured (total length to the nearest mm). The fish identified in the field were returned to the river; others were preserved in 10% Formalin (V/V) and identified in the laboratory.

At Stations 8, 9 and 10, where deeper water and high turbidity made electrofishing more difficult, unbaited fyke nets (mesh size 25 mm) were used. At these three stations, 4 double-winged and 10 single-winged nets were set within a 200 m length of river; nets were set in the afternoon and lifted the following morning. The bag ends of the nets were always tied so as to be above the water to allow any platypus that may have been captured access to air.

Results

Ten species of fish were recorded (Table 1); nine are native and one, brown trout, is exotic to Australia. The species of fish captured with each sampling method are shown in Table 2. Electrofishing was the least selective (in terms of species caught), and captured all species recorded during the survey. Only river blackfish were captured alive in fyke nets. The smaller common galaxias and the Australian grayling were captured when they became gilled in the wings of the nets and could not be released alive. Attaching the bag ends of the nets above the water proved successful. On one night nine platypus were captured and were released alive the following day.

The numbers and size range of each species captured at each sampling station are shown in Table 3. The most commonly occurring native species were the short-finned eel (7 stations) and the river blackfish (6 stations). The galaxias show a longitudinal succession in that the climbing galaxias occurred furthest upstream (stations 1 and 2), the spotted galaxias (stations 4 and 5) in the middle reaches and the common galaxias furthest downstream (stations 7 to 10). The introduced brown trout occurred at only two stations.

At station 9, hook and line fishing was carried out between 1800 h and 1930 h on one night only.

Discussion

The nature of the Tarwin River, particularly the very turbid water, made sampling difficult. Electrofishing was the least selective method of sampling and was undoubtedly inefficient in terms of the numbers of fish collected. The results therefore give only an indication of the fish species present but not their abundance.

The number of native species (9) is high for a Victorian river and may reflect the relatively short distance

Table 1. Fish species taken in west branch of Tarwin River above Berrys Creek

Scientific name	Common name
Gadopsis marmoratus (Richardson, 1848)	River blackfish
Galaxias truttaceus Valenciennes, 1838	Spotted galaxias
Galaxias brevipinnis (Günther, 1866)	Climbing galaxias (formerly known Cox's mountain galaxias)
Galaxias maculatus (Jenyns, 1842)	Common galaxias
Pseudaphritis urvilli (Cuvier and Valenciennes, 1831)	Tupong
Retropinna semoni Weber, 1895	Australian smelt
Prototroctes maraena Günther, 1864	Australian grayling
Anguilla australis Richardson, 1848	Short-finned eel
Geotria australis Gray, 1851	Pouched lamprey
*Salmo trutta Linnaeus, 1758	Brown trout

*Introduced species

Table 2 Survey methods and species captured at sampling stations

Station	Sampling method	Species captured
All Stations	Electrofishing	All species
8,9,10	Fyke nets	Gadopsis marmoratus
		Prototroctes maraena
		Galaxias maculatus
9	Rod and line	Gadopsis marmoratus

(about 85 km) from the sampling region to a large estuary, Andersons Inlet. Only the river blackfish and possibly Australian smelt are obligatory permanent residents of freshwater. The spotted galaxias, climbing galaxias and common galaxias are facultative catadromous species (may migrate to estuaries to spawn although landlocked forms can complete their life cycle in fresh water) whilst the tupong is an obligatory catadromous species (must migrate to estuaries to spawn). The pouched lamprey and probably the Australian grayling are obligatory anadromous species (spend part of their life cycle at sea and migrate to fresh water to spawn). The introduced brown trout is normally a permanent resident of fresh water and its presence at only two stations may reflect the unsuitability of the river for this species, particularly the high turbidity and the lack of suitable gravel on which to spawn.

Table 1. Number and range of total lengths of species captured at each sampling station.

Species	Range of total lengths (mm) and, in parentheses, number of each species caught at the 10 sampling stations									
Station No.	1	2	3	4	5	6	7	8	9	10
Galaxias truttaceus				65 (1)		172–195 (3)	180–402 (2)	165 (1)	172–395 (7)	180–335 (4)
Galaxias truttaceus				128–145	121–350					
Galaxias brevipinnis	58–61	61								
[illegible]							120 (1)	146 (1)	137–178 (7)	144–167 (6)
[illegible]				93		91–207 (3)	91–160 (3)	92–221 (6)		134 (1)
Retropinna semoni				68–69 (2)						
Prototroctes maraena							98–113 (4)		110 (1)	110 (1)
Anguilla australis	238–482 (3)		475–630 (2)	231–721 (5)	378–662 (4)	125–352 (2)	188 (1)	552–630 (2)	557 (1)	
Ictaria australis							94 (1)			
Salmo trutta							1			

The longitudinal succession shown by the climbing galaxias, the spotted galaxias and the common galaxias has also been noted by Frankenberg (1974). Although all three may occur together in the lower parts of streams as they all may migrate to estuaries to spawn, they do not co-exist in freshwater; all three show adaptions to different freshwater habitats. The climbing galaxias have ventrally placed, broad pectoral fins associated with its climbing ability and penetrates further upstream than the spotted galaxias. The common galaxias is more prevalent in still open waters and is able to withstand higher water temperatures than either the climbing or the spotted galaxias.

The occurrence of Australian grayling in the Tarwin River is of interest. Although once common (Turnbridge 1972), the grayling is now Australia's most seriously threatened freshwater fish (Lake 1971). Its precise life history is not known but the species probably spawns during late summer-early autumn. The larvae drift downstream and the juveniles return upstream towards the end of their first year (Bishop and Bell 1978). The size range of the specimens captured in this survey (98-113 mm) is just below that of grayling (113-165 mm) estimated to be in their second year of life in the Shoalhaven River, N.S.W. (Bishop and Bell 1978). The grayling captured in the Tarwin may have been juvenile fish returning upstream from the estuary at the end of their first year of life.

The Australian grayling is most commonly associated with clear, gravel-bottomed rivers, e.g. Tambo, Mitchell and Wonnangatta Rivers and its presence, in such a muddy bottomed, heavily silted river is unusual. Whether they can successfully spawn there is uncertain.

Acknowledgements

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The Importance of Basalt in Eastern Australia

By A. W. Beasley*

Basalt is the most common volcanic rock. It is formed from the cooling and solidification of molten lava which was poured out on the land as the result of volcanic activity. Basalts are common in a belt which extends down the eastern part of Australia from Torres Strait to Tasmania and westwards to the Mt. Gambier district in South Australia. This belt was the site of considerable volcanic activity during Cainozoic times, which extend from the present back to about 65 million years ago. Extensive flows of basaltic lava covered some quite large areas, and in many places a succession of lava flows was piled up one above the other. This Cainozoic volcanicity presumably was closely related to the earth movements that gave rise to the Eastern Highlands of our continent. It is interesting to consider the economic importance of these basalts, and to realise the pleasure and fascination they can provide for field naturalists interested in minerals and rocks.

Soils derived from the weathering of basalts in eastern Australia are undoubtedly one of Australia's greatest resources. These soils have a relatively high content of such elements as iron, and are generally rich in plant nutrients. The fertile soils of such important farming regions as the Western District in Victoria and much of the Darling Downs in Queensland are due largely to the weathering and decomposition of basalts under favourable climatic conditions.

Basalt was used extensively as a building stone during last century, particularly in Victoria where Cainozoic basalts cover about one-fifth of the State. It was favoured particularly for building churches and public buildings, but many private dwellings were made from blocks of basalt during the early days of white settlement. In former times it was commonly used for foundation purposes and for the base-courses of buildings, such as the Melbourne Town Hall and many others.

Basalt is a hard, fine-grained rock, and the fresh (unweathered) rock obtained by quarrying is very resistant to erosion. Localities where the flows of the old basaltic lava are thick are preferred for quarries. In quarrying the rock, use is made of natural fractures called joints which are regularly arranged in a pattern. Most of these joints are the result of shrinkage which developed as the lava cooled. Following quarrying, the cutting, shaping and dressing of blocks of basalt to the required sizes for building purposes was an arduous task, and it is no wonder that the stonemasons were Melbourne's first workers to insist on an eight-hour day. Much of the basalt used for building purposes in the early days of Melbourne came from quarries at Footscray and Malmsbury. Basalt is dark-coloured, and in the building trade is known as bluestone. It is not much favoured now as a building stone, but is still used. For example, it was chosen for building the National Gallery of Victoria, part of the new Arts Centre in Melbourne. Large slabs of basalt are used for paving, particularly in public places such as the Melbourne Civic Square and the adjacent city footpaths.

Blocks of basalt known as bluestone pitchers were used extensively in Victoria for road kerbing and guttering in former times. These street gutters are now being replaced by concrete ones, and the bluestone pitchers are being offered for sale by municipal authorities. They are very suitable for constructing retaining walls, and I have used them for this purpose in my home garden.

Huge blocks of basalt have been quarried to build breakwaters at Portland in Victoria, Tweed Heads in New South Wales, and other places around our coast. They have also been used to form

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Fig. 1. Soil developing from the weathering of basalt near Heywood, Western Victoria.

rock cliffs at the top of the beach to prevent marine erosion from destroying valuable coastal property, as on the Gold Coast in Queensland.

Basalt is used extensively in making roads in many parts of eastern Australia. The rock is first broken up by crushers in the quarry plant and it is then screened to the required size. In former times it was widely used as loose road metal, commonly called blue metal; this has also been extensively used for railway track ballast. Because of its wearing qualities and its adhesion to bitumen, large quantities of basalt are employed as aggregate in bitumen road construction. Basalt screenings are used extensively as a fairly coarse aggregate in concrete.

To the mineral collector the main importance of basalt is as a source of mineral specimens found in cavities and pockets in the rock. These include carbonate minerals such as aragonite and calcite, silicates such as minerals of the zeolite group, and silica minerals such as agate (cryptocrystalline quartz) and coarsely crystalline quartz. Cavities are formed in the solidifying lava by the expansion of gases escaping from solution, and they are most abundant near the top of the old lava flows. Some of these cavities, formed by escaping gases and from other causes, have been completely filled with minerals, but many are only lined and partly filled. It seems that some of the minerals were deposited from circulating solutions during the final stages in the cooling down and solidification of the lava, and that others were precipitated at a much later time from aqueous solutions percolating through the rock.

The minerals grew inwards from the walls of the spaces they occupy and, when they had sufficient room to grow, they developed their various crystal forms. Many beautiful crystallized specimens have been collected from cavities in basalts in eastern Australia. They have been obtained from quarries and from basalt exposed in cuttings, cliffs and shore platforms. Fossickers usually break the rock first with a large sledge-hammer, and then break down the pieces further with a club hammer and

Fig. 2. House built from blocks of basalt at Camperdown, Victoria.

Fig. 3. Crystals of natrolite, a zeolite mineral, in basalt from near Flinders, Victoria.

geologist's hammer until the desired specimen is obtained. Great care must be taken at the last stage not to shatter the crystals.

Weathering and decomposition of basalt over long periods of time has released some of the cavity-filling minerals into the soil and into alluvial deposits such as stream gravels. These are the hard and resistant ones such as agate and other silica minerals. This has happened, for example, in the Agate Creek region of northern Queensland where, over a large area of basalt country, hollow geodes and solid nodules of agate may be found lying loose on or near the surface. The geodes represent cavities which were only partly filled with mineral matter, while the solid nodules filled more or less rounded cavities in the basalt. Agate from this region is highly prized as an ornamental stone. Some of the geodes contain crystals of quartz projecting in towards the centre of the cavity.

Crystals of sapphire have been observed in basalt that occurs in an extensive area centred around Anakie in Queensland and another large area centred around Inverell in New South Wales. Prolonged weathering of the basalts in these regions has resulted in the occurrence of what are believed to be the largest sapphire gemfields in the world. More than 75 per cent of the world's annual supply of sapphires comes from these regions. Although most is obtained by mining companies and syndicates, an appreciable quantity comes from mining operations conducted by individuals. Fossicking in these regions by gem-hunters has become an important tourist attraction.

The sapphires originally occurred in the basalt as comparatively large crystals which formed at an early stage when the molten rock-material was deep down in the Earth, probably in the upper part of the Earth's mantle, the zone below the crust. They crystallized at this considerable depth under high pressures, and were brought up to the surface as solid inclusions in the molten material which erupted upon the surface as basaltic lava. It seems most probable that the sapphires were very sparsely distributed in the basaltic lava, and could have been restricted to, or more common in, certain flows.

The processes of weathering have caused the decomposition of much of the basalt on the Anakie and the Inverell gemfields, but because sapphire is a hard and resistant mineral it has survived. It has reached economic grades in alluvial deposits through natural concentration by water in quick-flowing streams, since it is a heavy mineral.

Our basalts provide both profit and pleasure. By searching for mineral specimens in basalt, and from hunting for gemstones released from this rock, one is provided with various stimulating activities. Apart from their hobby value which may be very rewarding, such activities can have economic and scientific value.

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Bush-peas of Victoria — Genus Pultenaea —12

By M. G. Corrick*

***Pultenaea humilis* Benth. ex Hook.f. in Flora Tasmaniae 1: 91 (1856).**

Pultenaea humilis is widely distributed through central and western Victoria with isolated occurrences in Gippsland and on Pine Mt. It also occurs in Tasmania.

P. humilis is usually a low, spreading and somewhat decumbent shrub about 30-50 cm high, but its growth habit is very variable and erect forms up to a metre high occur in several areas. It is often found in heathland communities where it appears to tolerate quite wet conditions for much of the year. However, in central and eastern Victoria and in parts of the Grampians it may be found in more elevated situations where the soil is rocky and usually dry.

The stems are rounded and mostly hairy; the alternate, oblanceolate or elliptic leaves are 6-14 mm long and 1-4 mm wide with incurved margins and acute, but blunt tips. The underside of the leaf is usually hairy; the upper surface is glabrous and when dried is often paler. The stipules are dark brown with papery margins and are sometimes joined together near the base.

The flowers are axillary, usually about 10 mm long with the standard 10 mm long and 10 mm wide. They are on short, but distinct pedicels 2-4 mm long and crowded in spikes towards the ends of the branches with a leafy tip that continues to grow as the flowers develop. They are bright orange with dark red lines on the standard and wings and a dark red or purple tip to the keel. The calyx is usually hairy and the three lower lobes are deeply divided and taper into longer, slender points.

The slender, linear bracteoles have incurved, papery margins and may have some rather long loose hairs, particularly along the mid-rib. They are attached at the base of the calyx and are as long, or slightly longer than it. There are no floral bracts but the leaves within the flower spike may be somewhat reduced and have enlarged stipules.

The ovary is glabrous except for a tuft of rather long hairs at the base of the style. The pod is plump and almost hidden by the calyx. Main flowering time is late November extending to mid-December in higher, cooler areas.

Pultenaea humilis is a species which shows great variation, not only in size and growth habit but also in the size of the leaves and the degree of hairiness; it also appears tolerant of a variety of soil types and situations.

Pultenaea humilis var. *glabrescens* H. B. Williamson in Proc. Roy. Soc. Vic. 33: 133 (1921) was described from collections made in several localities, including Creswick, Sale and the Grampians. J. H. Willis (1972) notes that this taxon occurs widely over much of the State mingling with more typical forms. He notes little correlation between leaf shape and degree of hairiness and doubts whether this variety is worthy of recognition. More recent collections and field observations seem to uphold this view.

SPECIMENS EXAMINED included: Between Dartmoor & Wilkin, A.C. Beauglehole 40013, 8.xi.1959 (MEL 530047); Grampians, near Chimney Pot, M.G. Corrick, 16.x.1965 (MEL 532445); Rushworth Forest, M.G. Corrick 3537, 3.xi.1973 (MEL 532446); Grampians, Victoria Valley, P.K. Gullan, 6.i.1977 (MEL 523872); Macedon Range, Mt. Robertson, Barry Kemp, 12.xii.1976 (MEL 519680); Sale, T.A. Robinson 1898 (MEL 530211); Pine Mt., J.H. Willis, 15.i.1964 (MEL 540483)

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Fig. 15A. Known distribution of *Pultenaea humilis* and *P. subspicata*.

***Pultenaea subspicata* Benth. in Fl. Aust. 2: 137 (1864).**

The distribution of *Pultenaea subspicata* in Victoria is restricted to a few isolated areas in East Gippsland close to the New South Wales border near Wulgulmerang. It also occurs in N.S.W. and A.C.T.

P. subspicata is a low, decumbent or almost prostrate shrub with pale, rounded and mostly glabrous stems. The alternate, obovate leaves are 3-8 mm long and 1-1.5 mm wide with an obtuse tip. They have a short, but distinct petiole about 1 mm long and the margins are curved up. The upper leaf surface is glabrous, and when dried is paler than the undersurface, which usually has a few scattered pale hairs. The light brown stipules are 1.5-2 mm long, united for about half their length and closely appressed to the stem.

The flowers are axillary, usually about 9 mm long and arranged in a rather long spike with a leafy tip. They are orange in colour with red-brown markings on keel and standard which is 9 mm high and 7 mm wide. The calyx is 6 mm long with slender, acute lobes; the base of the tube is glabrous and the lobes hirsute with pale hairs.

The bracteoles are 2 mm long and

Fig. 15B, a-g, *Pultenaea humilis*: a, habit; b, calyx and bracteoles, bracteole drawn a little larger; c, style; d, leaves and stipules, all from MEL 532445; e, broad leaf form from Rushworth forest, MEL 532446; f, narrow, glabrous leaf form from the Grampians, MEL 519680; g, pod and seed, from MEL 523872. h-n, *Pultenaea subspicata*: h, habit; i, calyx and bracteoles, bracteole drawn a little larger; j, style; k, leaf and stipules, all from MEL 529832; l, East Gippsland form with hairier leaves; m, pod; n, seed, all from MEL 529834.


a
1cm
e
1mm
d
1mm
f
1mm
g
1mm
k
1mm
n
1mm
i
1mm
l
1mm
j
1mm
m
1mm
h
1cm

more or less three lobed or winged, with a line of hairs down the mid-rib; they are attached at the base of the calyx and reach about one third of the way up the calyx lobes.

There are no floral bracts, but the united stipules of the floral leaves are much enlarged and if the leaf is bent back or broken off these stipules may easily be mistaken for bracts.

The ovary is glabrous except for a few hairs at the base of the style. The pod is plump but does not extend beyond the calyx lobes except for the slender, curved style on young pods.

P. subspicata is very similar to some forms of *P. humilis* but may always be recognized by the distinctive, broad three-lobed bracteoles. Also, according to present records, the distribution of the two species does not appear to overlap.

SPECIMENS EXAMINED included: East Gippsland, Rocky Range Rd., A.C. Beauglehole 36102, 14.i.1971 (MEL 529834); Wulgulmerang, A.W. Howitt 445, 1882 (MEL 529837); Splitters Creek, Wulgulmerang, J.H. Willis, 3.xii.1962 (MEL 529832).

Dandenong and Mount Corranwarrabul

The name Dandenong does not, as stated in the report of Mrs Weatherhead's talk on the botany of Sherbrooke at the April general meeting of F.N.C.V. *(Victorian Nat. 96:* 114), come from an aboriginal word Banyenong meaning 'bush burnt a long time ago'. It is well documented that the name was given in 1837 by Captain William Lonsdale, who, in an official report on the district, spelt the name Dan-y-nong. He wrote that it was always most difficult to catch the sound of native names as spoken by aborigines, who rapidly ran over 'd' and 't', making it hard to distinguish between these two consonants. Hence, the first surveyors, who made the original survey in the 1840's, spelt it Tangenong. They probably interpreted the name differently from Lonsdale after hearing it pronounced by the tribesmen. This word is rendered Tanjenong by Les Blake in his recently published book 'Place Names of Victoria', with the meaning given as 'lofty mountain'. This follows A. E. Martin, who in his 'Place Names in Victoria and Tasmania' (1944) gives both Dan-y-nong and Tanjenong, with the meaning 'lofty'.

This name for many years referred only to the township (now the city of Dandenong) and Dandenong Creek, not to the mountains now known as the Dandenong Ranges, which in early colonial times were known as the Eastern Ranges and sometimes by their aboriginal name, Corrhanwarrabul Ranges (sometimes spelt Corranwarrabul as in the 1884 report referred to in 'Naturalists of Yesteryear' in the same issue *(Victorian Nat. 96:* 95). It would be more accurate to say that the present Mount Dandenong was called by the blacks Corranwarrabul, restricted in meaning to that mountain alone, as it was not their usual custom to assign names to such large regions as these ranges cover; indeed they had separate names for much smaller areas than an entire mountain. That early F.N.C.V. excursion to Mount Corranwarrabul was actually a trip to Mount Dandenong, which many readers would not have realized. The aborigines used names for places that they did not always know the meaning of, and the meaning 'lofty' or 'lofty mountain' is probably a white man's assumption. I have searched all the early Victorian vocabularies of Aboriginal words published in the second volume of R. Brough Smyth's 'The Aborigines of Victoria (1876), and no name like

Dandenong appears in any of them.

Aldo Massola, in 'Aboriginal Place Names of South-East Australia and their Meanings' (1968), has this entry for Dandenong: Dan-y-nong or Tan-jenong, to be going to eat; or tang, frost, jenong, foot, i.e. frost-bitten feet (presumably from bleak weather in the high country). Massola's entry for Dandenong Ranges and Mount Dandenong reads: Cor-han-warabul, the camp of the drinking water of the kangaroo. I do not know what sources he used for the above — he *did* talk to some of the oldest fullblood survivors, but the tribes near Melbourne died out very early — Dandenong was in the territory of the Bunurong tribe (known to the white man as the Yarra Yarra tribe), whose lands extended from the Werribee River to Western Port and inland to the Latrobe River. Massela, in 'Journey to Aboriginal Victoria' (1969), refers to a second Yarra tribe, the Woewurong, who roamed the northern areas of this range (not coastal, like the Bunurong).

A. W. Reed, in 'Place Names of Australia' (1973) and 'Aboriginal Place Names and their Meanings' (1967), gives the meaning of Dandenong as 'high' or 'lofty', but his books were not compiled from primary sources, but from various published aboriginal word books.

By the late James A. Baines.

On Lawns, Wildflowers, Weeds and Orchids

It is almost thirty years since we came to Pascoe Vale. That long ago it was a district of open space and sparse settlement. We established our home on the north-eastern slope of grasslands (mainly "onion-grass" by the way) that dipped down gently from the Gaffney Street plateau to a swamp that eventually drained into the Moonee Ponds Creek. The little valley of the creek that fed the swamp is now built on, the creek itself has been converted to an underground barrel drain and the swamp no longer supports its one-time population of frogs, mosquitoes and other aquatic animal and plant life. Ibis, heron and plover no longer browse there although, occasionally, we do still hear the call of the plover who must surely visit the place for old times' sake. Now the Indian mynah, sparrow, starling and blackbird have taken over the territory, joined, sometimes, by a mudlark or two. Now and again the air is enlivened by the squawk of some ravens, the cooing of a pair of doves or the trill of an English thrush but, despite the fact that our garden is packed with native trees and shrubs we now see and hear few native birds. Once upon a time we used to glimpse scarlet-breasted robins, restless fly-catchers, willie wagtails, welcome swallows, swifts, superb blue wrens, pallid cuckoos, spinebills, magpies, crimson wattle-birds, little wattle-birds and two or three of the other and smaller honey-eaters and, one evening, an owl! But not now. Certainly, there is plenty of birdlife far above us — flocks of one sort or another on the move to fresh feeding grounds or to roosting sites — but, down below here, wattle-birds, greenies and silver-eyes seem to be the only birds that bother to forage among the foliage and blossoms of our shrubs and trees. However, we acknowledge the advent of the pack of sulphur-crested cockatoos that descended upon us recently (or, to be strictly accurate, that descended on our neighbour's walnut tree) and of a few galahs that have wheeled about the place on some sort of reconnaissance.

As it once was

When we first came here there were plenty of skinks to be seen scurrying away from wherever they happened to be sunning themselves. We saw no snakes although it was well known that tiger snakes slithered about among the abundant artichoke thistles, box thorn clumps and basalt rocks that were to be seen further down the valley towards the Moonee Ponds Creek. Oddly enough, it was not until 1978, some twenty-eight years after our mahogany gum was planted, that our first "paddy-foot" — a marbled gecko — was discovered. It was sunning itself on the rough bark of that gum tree. We haven't seen it since. Was it a survivor from the past or was it an accidental or deliberate introduction? Loads of firewood are no longer brought to households in our neighbourhood so we feel sure that our gecko did not arrive in a load of firewood — in recent times, at any rate. Our neighbours are not given to collecting live reptiles so we discount that proclivity as a likely means of its introduction here. Surely it is a relic of bygone days or a descendant of such relics. It was seen on only the one occasion but we still

hope that it is a resident and that it has access to a mate and that it (or they) dwell among a dreadful collection of timber and derelict hardware that is dumped in the decrepit shed of the people next door and that it has not been discovered and despatched by any of the army of domestic cats that infest the neighbourhood. We have a love-hate relationship with cats.

When we possessed them they were showered with affection but we were glad when they eventually departed this life. We are now able to blame other people's cats for the depletion of the once abundant stock of native fauna in our area — especially the small birds, skinks and other little edible creatures that were a part of the ecosystem hereabouts. The establishment of a complete set of houses and their gardens together with the paved streets on what was once those open grasslands has, of course, had a far greater impact on our environment than the cats of the district.

Plants, past and present

And what of the native vegetation? The first one hundred years of occupation of this region as a pastoral "run" for sheep and cattle altered the composition of the vegetational ground cover beyond recognition by the shade of any European pioneer who may have gazed upon it that long ago.

The place where we live is on the edge of a part of one of the "recent" lava flows. Indeed, the soil of our backyard is that heavy and sticky (when wet) or rock-hard (when dry) basaltic clay which cracks open in summer. Probably it supported an array of herbaceous plants of a type that still survive in a few places on the Keilor and Werribee Plains. When we came here we found a few indigenes such as blushing bindweed, billy button, curled everlasting, twining glycine, autumn grass-lily, swamp isotome, both slender and glistening dock, a spear grass and a couple of wallaby grasses. There were (and still are) a few others such as kidney weed and the native paspalum which refuse to be suppressed. No doubt there were other species in places a little distant from our place but we were, at that time, much too busy establishing hearth and home to thoroughly explore the environs and, by the time we had reached a stage when time for such exploration had become available, other houses and gardens had covered the paddocks.

As an item of interest we should mention that the lava flow referred to above appears to have terminated at a spot that is now underneath our kitchen. From thereon the soil is a nice workable loam that is faintly coloured with iron oxide. It overlies the white clay and water-worn pebbles that, together, form the bed of what was once an ancient stream. We managed to acquire a sizeable load of this slightly calcareous gravel plus an assortment of sandstone rocks of various shapes and sizes from depths ranging from one to two metres when the trenches were being dug to accommodate sewer pipes.

The gravel was excellent for the odd jobs of concreting that we undertook in those days. We still have some! As for the sandstone, it was distributed in strategic places in the front garden to provide root shelter for the many native plants that have been introduced during our years of occupation.

Orchids in the lawn

Ours is a curious sort of garden; especially so in the front of the house where what are usually shrubs graduate to robust trees and where Mallee plants mingle agreeably with those from east coast habitats or from mountain fastnesses, from the sand plains of Western Australia or the banks of the River Murray. Alpine plants have been tried. Some have endured for years and died either of old age, mischance or neglect. Some which others grow with no trouble at all just won't grow in the spots we select for them but, at least, we can now boast of orchids growing in the backyard lawn.

That so-called lawn is an area of about seven metres by seven metres. When we first knew it it was well vegetated with couch grass, two kinds of paspalum, onion grass, various docks, dandelion, cape weed, a few sorts of thistle as well as cape tulip and thread iris. We had it rotary hoed and then laid out a conventional lawn. With the passage of time the conventional character has become somewhat subdued. The couch and paspalum have re-established themselves and, in between, there is a rich growth of three or four species of oxalis, a grand crop of thyme speedwell, some kidney weed, nice patches of a little club-rush, *Scirpus americanus*, a few tufts of onion grass and more than occasional plants of thread iris and cape tulip along with such other gems as cudweeds, a willow-herb, a storksbill, a bitter cress, field madder, corn spurrey and, perhaps, a few others. It would seem that most of these species have just "dropped in" so to say and, finding the habitat agreeable, remain to thrive and multiply until we happen to discover them and wage a campaign of extermination as we have done with clovers, medics, dandelions, cape weeds and sow thistles. However, among these intruders in our lawns is one that was first noticed in 1975, while mowing the grass (and other plants). I noticed a leaf that reminded me of that of an onion orchid or a leek orchid. The site was left unmown to allow the leaf to develop. It did but eventually it withered leaving the identity of the plant unrevealed. In the winter of the

following year there appeared two of those leaves at the same spot and, in November a flower spike emerged to reveal that the orchid was *Microtis unifolia*. Since that time the number of plants has steadily increased until now, in 1979, there are eleven. From the six plants noted in 1978 there developed three flower spikes. We got half a dozen spikes this year.

Because of the history of the "lawn" it is highly improbable that the tubers of the plant were there in 1950. Rotary hoeing tends to bury surface material a bit too deep down for survival of anything less tenacious of life than paspalum which can make its way back to the surface through nearly half a metre of soil. We have never brought *Microtis* tubers on to the property and even had we done so we would not have discarded them onto the backyard lawn. No. The first plant must surely have derived from an air-borne seed that just chanced to lodge in a suitable niche in the grass and then, perhaps, washed into the soil by rain or hosing, there to germinate under conditions which were just right.

In the world of plants native orchids were our first love. We have never lost interest in them nor ceased to admire them but I, at least, have a sneaking regret that chance did not blow in a seed of, say, a purple diuris. That species was once a native of the district, as we know, because, years ago, we came upon a small surviving colony of it in flower in the railway reserve beside the track between Fawkner and Campbellfield. We wonder whether the colony still persists there. Another experience we have enjoyed suggests that it is not all that peculiar to have purple diuris growing in a backyard lawn. Years ago, when in Queensland, we visited the rather unique freshwater lake Cooloolah which is situated in the dunes and about a couple of kilometres inland from Laguna Bay. After lunching beside the lake we tracked through the bush towards the coast and came upon a week-ender's holiday house not far from the beach. To our astonishment we saw dozens of flowering plants of the diuris scattered about on the spacious lawn. We recognized it as a backyard lawn because there was a clothes hoist in the middle of it.

And we believe there is a lesson to be learned from such occurrences: don't overdo your lawn mowing. Among the consequent rank growth you may chance to discover something rare, uncommon or unusual!

J. Ros. Garnet

Naturalists of Yesteryear

By R. Simmons

An interesting issue of "The Victorian Naturalist" is Number 9 of Volume 4. The whole issue is given over to what appears to be a major exercise by the Club, an expedition to King Island. The issue gives an excellent insight into the conditions which early naturalists had to suffer in their quest for knowledge, as well as showing the contribution to science that naturalist excursions make.

When landing on King Island, "Mr. Garraway, the Superintendent of the Wickham lighthouse had come out to meet us in his boat and kindly volunteered to accompany us to our main camping ground." However, "owing to the nature of the coast and sea, we had to be landed a mile and a half to the south of the landing site." Because of this unfortunate occurrence it was necessary to carry all our luggage but "by dint of hard work we had all important stores under shelter and tents up before dark". This was lucky for the expedition as "the evening brought rain, and the next morning broke dull and threatening, with a cold, easterly wind.

"The first two or three days were occupied, between intervals of pouring rain, in making short excursions for some few miles into the surrounding country." It was decided "that the party separate — some to go right across the island to the east coast". This party which had the longest route to follow suffered greatly from the elements. "Travelling was rendered extremely uncomfortable by the rain, which fell in torrents," they followed a track which "lies completely under water, rendering walking somewhat difficult until the hunter's hut, known as Bertie Camp, was reached. Here a halt was made, a huge camp-fire lighted, and ti-tree boughs laid down to sleep upon, as the ground was soaking wet." Because of these conditions "when a start was made

(early next morning), two members of the party were staying at Bertie — one being too unwell to proceed and the other remaining behind to tend him."

Despite these setbacks and conditions the expedition gathered much information about King Island. "With regard to the botany, specimens of plants . . . have been submitted to the Baron von Mueller who kindly promised to name them for the Club. So far as it goes at present the list is seen to contain 204 species, of which 16 are imported weeds leaving 187 common to Victoria and Tasmania and one found in Tasmania and not in Victoria."

The fauna was "of considerably greater interest than the flora and shows the island to be Tasmanian rather than Victorian. With regard to mammals the evidence is both negative and positive. In the lowest forms, the Monotremes, the platypus was not captured, but the echidna is more distinctly the hairy variety *(E. setosa)* of Tasmania.

In the marsupials the evidence is negative in the absence of numerous forms found in Victoria and positive in the presence of the wallaby *(Halmaturus billardierii)* and brush kangaroo *(H. bennettii)* of Tasmania.

In the birds the evidence is more striking. So far, 69 species have been identified of which 54 are common to Tasmania and Victoria, 14 are peculiar to Tasmania, and only 1 to Victoria."

The reptiles and fresh-water fish "were forms common to Tasmania and Victoria" but from the evidence that was collected the author concluded "that King Island is allied *naturally* as well as *politically* to Tasmania. Zoologically, the differences between the mainland and Tasmania are not very great, consisting in the presence of a certain number of different species of mammals and birds peculiar to Tasmania . . . King Island is still poorer, zoologically; but in its peculiar species, as already seen, it resembles Tasmania."

Editor's note: The three species of mammals reported in this article have all since had their names updated. Thus the echidna is *Tachyglossus aculeatus* (there exists only *one* species of *Tachyglossus*) and as for the macropodids, *H. billiardierii* (the pademelon) is *Thylogale billardierii* whilst *H. bennetti* (Bennett's wallaby) is considered conspecific with the mainland red-neck wallaby *(Macropus rufogriseus).*

A Comparison of Three Techniques Used in a Reptile Survey of the Conondale Ranges

BY DAVID A. MILTON*

Introduction

The purpose of the majority of faunal surveys has been to provide information on species distribution and habitat preference. They have tended to involve short-term intensive fieldwork, while attempting to maximize return in terms of species present and numbers of individuals. Suitable faunal survey techniques should ensure that all habitats have been sampled effectively (Pattemore, 1977).

A recent study has compared reptile survey techniques in Queensland rain forests (Queensland Museum, 1977) and concluded that knowledgeable search and hand collection was the most effective technique for surveying rain forests reptiles. The Conondale Ranges, an area of wet sclerophyll and rain forest, 120 km N.W. of Brisbane (see Figure 1), has a unique and specialized faunal assemblage. Several vertebrate species have restricted ranges and are of great scientific interest. For example,

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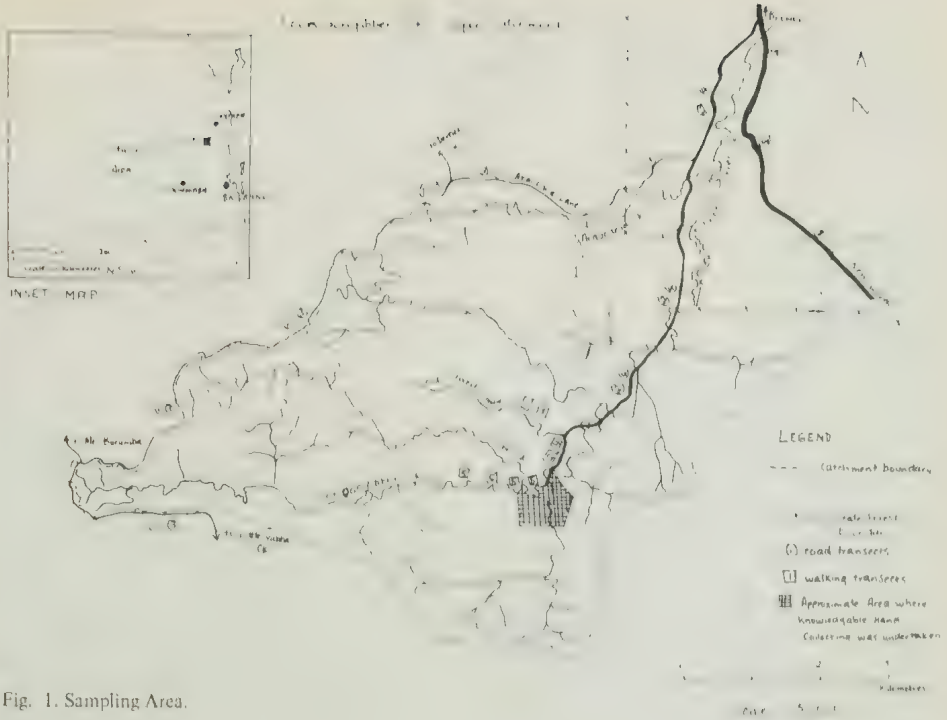

Fig. 1. Sampling Area.

the leptodactylid frogs *Rheobatrachus situs* and *Assa darlingtoni* both possess reproductive strategies which do not occur in other amphibia (Corben *et al* 1974, Ingram *et al* 1975). Czechura (1976, 1978) listed the reptiles of the Conondale Range and established a range extension for *Litoria brevipalmata*. The complex reptile fauna and vegetation of the Conondale Ranges of Queensland offer a natural laboratory for comparing the three survey methods.

The present study will compare the knowledgeable search and hand collection technique with two other techniques of reptile surveying: road transects and walking transects, and assess their relative efficiency in terms of species and specimen numbers returned.

Methods

A. Collection Methods:

Three techniques were employed to systematically sample the reptile fauna of Coongoongibber Creek catchment: (Figure 1)

(1) Knowledgeable hand collecting: The technique involved turning and destructive sampling of logs, litter, trees and pursuit of specimens. The technique, although qualitative, has been widely used to obtain the full complement of reptile species in an area when undertaken by experienced field workers (Cogger and Lindner, 1974; Storr and Smith, 1975, 1977; Queensland Museum, 1976, 1977).

(2) Road transects: The technique involves travelling in a vehicle set

distances at a predetermined speed, along roads. The method has been used to determine relative changes in densities of animal populations (Wight, 1959; Newman, 1959; Kline, 1965). Data can be expressed as the average number of specimens observed per kilometre travelled. In this study, well-used forestry roads were travelled at night and during the day.

(3) Walking transects: The technique involves walking an arbitrarily defined distance at a predetermined rate (x paces/hr) and during this time, turning all logs, stones, bark, etc. and searching the ground and canopy by eye and identifying any specimens observed. Pattmore (1977) recommended that for simple survey work, extended walking transects in cold and/or overcast conditions could be most effective, as animals are likely to be torpid and easier to capture. During this study, the method was employed along forestry trails, little used roads and in straight lines across the terrain. This differs from (1) above, in that it was employed along defined routes, independent of habitat. Knowledgeable hand collection, though, is habitat selective, being biassed by the collector's concepts of the most suitable habitats to detect specimens.

B. Methods of Analysis:

To determine whether the three methods were comparable, in terms of species collected, an overlap of return Index was calculated, using the community comparison coefficient of Whittaker (1973),

$$DI = \frac{Sab}{Sa + Sb}$$

where DI = Overlap Index

Sa = number of species detected by method A only

Sb = number of species detected by method B only

Sab = number of species detected by methods A and B.

The index has been used primarily to compare the species composition of two floristic communities, however the calculations are meaningful in faunal assemblages.

The relative efficiency of each method was assessed by a simple efficiency index for species and specimens collected.

$$E_A = \frac{S_A}{t_A}$$

where E_A = efficiency of method A (Sp./hr)

S_A = species collected by method A

t_A = time (hrs.) expended using method A

$$Es_{xi} = \frac{Sx_i}{tx_i}$$

where Esx = efficiency of Method X (no./hr.)

Sx_i = total specimens collected by method S

tx_i = time expended using method X (hrs.).

Results

A total of 138 specimens were collected using the three methods between 17 September 1978 and 29 October 1978, representing 29 reptile species from nine families.

Table 1 contains a list of the species collected and the number of individuals of each species, using the three techniques, including the total number of specimens from each species (A) and the total number of specimens collected using each technique (B). The table shows that walking transects produced the largest number of specimens and species while hand collecting provided the least. The best represented family from the

TABLE 1
Numbers of each species collected by the three techniques.

Family	Species	TECHNIQUE A Driving	Walking	Hand	Total No. Individuals
Chelidae:	*Elseya latirostrum*	—	3	—	3
Gekkonidae:	*Oedura tryoni*	—	4	—	4
Agamidae:	*Amphibolurus barbatus*	3	—	—	3
	Physignathus leseurii	1	7	3	11
Varanidae:	*Varanus varius*	15	8	—	23
Scinidae:	*Anomalopus verreauxii*	—	4	1	5
	Ctenotus robustus	—	1	5	6
	Egernia frerei	—	6	1	7
	E. major	—	—	1	1
	Hemiergis graciloides	—	2	—	2
	Leiolopisma sp. *(delicata)*	—	3	4	7
	L. challengeri	—	2	—	2
	Morethia boulengeri	—	2	—	2
	Sphenomorphus murrayi	—	5	4	9
	S. quoyii	—	3	—	3
	S. tenuis	—	2	1	3
	S. *scutirostrum*	—	—	1	1
	Tiliqua gerrardii	4	—	—	4
Typhlopidae:	*Typhlina* sp.	—	9	—	9
Boidae:	*Morelia spilotes*	1	—	—	1
Colubridae:	*Amphiesma mairii*	1	1	—	2
	Dendrelaphis punctatus	7	8	1	16
Elapidae:	*Cryptophis nigrescens*	3	2	—	5
	Demansia psammophis	2	—	—	2
	Hemiapis signata	—	1	—	1
	Pseudechis porphyriacus	5	—	1	6
	Pseudonaja textilis	1	—	—	1
	Trophidechis carinatus	1	—	—	1
B	TOTAL	44	71	23	138

TABLE 2
Overlap index comparison between the three techniques.

Methods Compared	Overlap Index
Hand vs. walking	0.258
Walking vs. driving	0.161
Driving vs. hand	0.125

TABLE 3 Species efficiency index of the three methods.

Technique	Species Collected	Time Involved (hrs)	Efficiency Index
Driving Transects	12	10.7	1.12
Walking Transects	19	23.0	0.83
Hand Collecting	11	14.0	0.86

TABLE 4 Specimen efficiency indexes of the three methods.

Technique	Specimens Collected	Time Involved (hrs)	Efficiency Index
Driving Transects	44	10.7	4.87±3.35
Walking Transects	71	23.0	3.22±0.77
Hand Collecting	23	14.0	1.64±0.00

table was scincidae, with 52 specimens of a total of 139 while *Varanus varius* was the most abundant species with 23 individuals sighted.

Table 2 contains an analysis of the composition of the fauna of the three techniques using a co-efficient of community, from Whittaker (1973).

As expected, the hand collecting and walking transects showed the greatest similarity, due to the employment of basically similar techniques. Walking and driving transects were the next most similar both having followed established forestry roads. Driving and hand collection yielded the lowest overlap Index.

Table 3 contains a simple species efficiency index for the three methods used. It shows that the walking transects and hand collecting appear to be equally efficient while driving transects was somewhat more efficient than the other two techniques. All compare favourably with the overall species efficiency index of 0.61.

The results presented in Table 4 show that hand collecting appears to be less efficient in specimens returned than the other two techniques. While driving returned the highest specimen efficiency, it also has the highest variability in return with a much greater standard error than the other two techniques. Walking transects appears to produce the most reliable high specimen return. The overall specimen efficiency, of 2.89, is less than either of the two transect collecting techniques, while greater than hand collecting methods.

Table 5 shows that walking transects provided over half the species and specimens obtained, which represented 40% of the 46 known reptile species of the area. While the other two techniques produced only slightly more than half this percentage. The total species number collected, in 47.7 hours of fieldwork, provided over 60% of the known reptile fauna, which was compiled from ten years data (G. Czechura, pers. comm.).

Discussion

A total of 29 species of reptiles were collected during this study which compares favourably with the 46 known species recorded by Czechura (1976). These species probably represent the commonest or more accessible species in this area. There were several habitat types which were not represented in the Coongoongibber Creek catchment but which were included in Czechura's (1976) discussion of the Conondale Range reptile fauna. This suggests that 29 species represents a fairly close approximation of the total reptile fauna present in the Coongoongibber Creek catchment.

Table 2 indicates that the three techniques employed in their study sampled different reptile fauna elements. Whittaker (1973) stated that an overlap Index of less than 0.5, suggests that the techniques employed are sampling different communities. This contention is supported in this study by the data obtained from road transects (see Table 1). A total of 21 snakes were collected by the road transect technique while only 14 specimens were collected by the other two techniques combined. This probably can be explained in terms of snake thermo regulatory behaviour, which results in their seeking warm open areas, such as roads, for rapid heat uptake.

The result of the species efficiency Index in Table 3, compared the rate of detection of new species, between the sampling techniques and overall the sampling techniques. It indicates that there is little relative difference in the species detection efficiency between the three techniques using this index.

However, the fact that each method's species efficiency index was higher than the overall species index means that, although they sampled different faunal elements, there was some species redundancy between the techniques. The specimen efficiency index presented in Table 4 demonstrated that the technique of driving transects produced the

greatest number of reptile specimens per hour. However this technique had the greatest redundancy of previously encountered species, where some species are encountered more frequently than new species.

The technique of driving transects also has the problem that detection rate is extremely variable. The number of specimens located in each transect varies greatly. This suggests that the efficiency of this technique is closely dependent on environmental conditions in each transect, e.g. ambient temperature.

This study has highlighted several of the problems facing scientists conducting short-term faunal surveys of an area. To be effective, the data presented here suggests that the techniques used must account for behavioural requirements and habitat preferences of species present. Surveys which employ only one method are restricted in the groups of reptile likely to be encountered. The results of the survey will reflect this unconscious bias in the habitats sampled and the species detected. An example of this can be found in (Storr and Smith 1975, 1977), where few snakes were collected, relative to a likely complement present.

It appears that if a reptile faunal survey is to adequately sample the largest proportion of the total reptile complement in any particular area that at least two methods are necessary. The most effective techniques will vary within the vegetation structure of the area in question. In this study, conducted in closed forest and tall open forest it appears that the two transect techniques employed were the most effective. They provided 26 of the total 29 species collected.

Acknowledgements

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The Origin of Generic Names of the Victorian Flora

Part 2 — Latin, Greek and Miscellaneous

(Continued from page 249 in the previous issue)

By James A. Baines

Stenopetalum. Gk stenos, narrow; petalon, petal; because the petals taper into long points, sometimes twisted after flowering. Our 3 species are known as different kinds of Thread-petal. The genus is cruciferous.

***Stenotaphrum.** Gk stenos, narrow; taphron, a trench; alluding to the narrow rhachis of the spike. **S. secundatum*, Buffalo Grass, is the well-known coarse lawn grass, and it is thoroughly naturalized in many parts of Victoria. Native to Africa and tropical America, the U.S. vernacular name, St. Augustine Grass, comes from the name of the oldest town in Florida, founded by Spaniards in 1565.

Sticherus. Gk stichos, a row or line; er- possibly from erion, wool; from the woolly appearance of the rows of sori. The genus was set up by C. Presl in 1836, but it is only since 1940 that three of our fan-ferns, formerly in *Gleichenia*, have been transferred to it, a change not endorsed by all botanists. The family is Gleicheniaceae.

Stipa. Lat stipa, tow, the coarse part of flax (from Gk stuppe, tow); from the feathery inflorescence. Victoria has 22 native species, all known as kinds of spear-grass except *S. setacea*, Corkscrew Grass, and *S. nitida*, Balcarra Grass, and 1 introduced species, **S. neesiana* (named after the botanist C. G. Nees von Esenbeck), indigenous to temperate South America.

Strongylospermum. Gk strongylos, round; sperma, seed; a former name of *Cotula reptans*, Creeping Cotula, superseded since 1867. Family Compositae.

Stylidium. Gk stylos, column; because the stamens are united with the style to form a column. Australia has 110 endemic species, with 80 restricted to the S.W. of W.A., but Victoria has only 8 — the widespread Grass Trigger-plant, the Giant Trigger-plant, *S. laricifolium* (= larch-leaved) in far East Gippsland (Wingan Inlet), Grampians Trigger-plant, *S. soboliferum* (= bearing shoots or sprouts). Hundreds and Thousands, *S. inundatum*, and 4 others. The genus gives its name to family Stylidiaceae.

Stypandra. Gk stype (stuppe or styppe), tow, the coarse fibre of hemp or flax; alluding to the woolly stamens; aner, andros, man. Victoria has 2 species, known as Nodding Blue-lily and Tufted Blue-lily respectively. The genus is close to *Dianella* in family Liliaceae.

Styphelia. Gk styphelos, hard, rough; alluding to the stiff prickly-pointed leaves. Victoria has 2 species, including *S. adscendens*, Golden Heath. Some botanists have included in *Styphelia* species of *Leucopogon*, *Astroloma*, *Lissanthe* and some other epacridaceous genera, but the splitters appear to have won out against the lumpers!

Suaeda. Arabic suwaida, blackish, the Arabs' name for *S. vera* (according to Black), for *S. baccata* (according to Gilbert-Carter). Victoria's species are *S. australis*, Austral Seablite, and an unidentified introduced species growing at South Kensington. Blite has no relation to the English word blight, but comes from Lat blitum (Gk bliton), a tasteless herb used in salad. The genus belongs to family Chenopodiaceae.

OBITUARY

A.J. Swaby

At its last general meeting the Club neglected to refer to the passing of one of its oldest and most respected members — Mr Arthur James Swaby — who died on 20th October, 1979 at the age of 92. To make amends for this omission it is proper that an appropriate tribute be paid at this meeting by reminding older members and informing more recent members of the significant part Arthur Swaby played in Club affairs from the time he became a member in July, 1928 until recent years when age brought about its restraints.

I understand that he was born in Benalla and, in course of time, joined the Education Department which he served with distinction until his retirement in 1952. He was said to have been a very capable teacher and, had his family circumstances allowed of it, he could have proceeded to a degree course at the Teachers' College. However, that did not happen and he followed the usual course and eventually became the head master at several country schools — notably Horsham, and finally at Hampton. His stay at Horsham accounts for his deep interest in the natural history of the Wimmera, including the Little Desert and The Grampians which he explored during those earlier years. Remember, he had as contemporaries such men as H.B. Williamson and Charles Daley — both teachers. Indeed he joined the Club at a time when its membership included many of our most notable amateur botanists and field naturalists of considerable ability and renown. His own natural history interests were wide, as indicated by reference to the Club's Author Index in which his contributions to the Naturalist from 1934 to 1970 included 48 entries dealing with an interesting diversity of topics, many of them containing an overt or covert appeal to Club members to observe, investigate and record those little bits of information that, in toto, provide an answer to those many mysteries and problems that beset the biologist.

His first note in the Naturalist was an account of a Club excursion to Belgrave. In typical Swaby style he acknowledged the help he had received as leader of the excursion from a young Forestry Officer — one J.H. Willis who was credited with a profound knowledge of the cryptogams of the area. He was a regular exhibitor at general meetings, most of his exhibits being items that seemed to demand an explanation or arouse the question "Why is it so?" If he had the answer, he gave it.

During his first year of membership he assisted in running the Club's Wildflower Show and by that time, having become well known to other members, was, in 1931, elected to the office of Assistant Honorary Secretary and Librarian. Following the illness and subsequent death of Mr Rodda, the then Honorary Secretary, he succeeded to the office and held it until October, 1932 when he induced Mr Stan Colliver to take over the duties. The proposal to establish a Botany Group in 1945 brought Mr Swaby back into active involvement in Club affairs. In view of his long experience as a teacher it was inevitable that he should conduct a course in elementary botany with especial reference to native plants. When the Wildflower Garden Section was formed he was in that too — pressing the cause of preservation of Australian plants by cultivation in the garden.

In May, 1947 he was elected Vice President but, because of his many other commitments, he steadfastly declined to accept subsequent nomination as President. Some of those other commitments included his involvement with the post-war League of Youth and the Club's own sub-committees including Heathland Reserves, Youth Movements and the Maranoa Gardens Advisory Committee. In 1955, having retired from the Education Department, he was encouraged to serve on the Club's Council in place of Mr Fred Lewis and, after compelling persuasion, was nominated as President, an office he occupied with distinction in the year 1956-57. Now approaching his seventies, he remained active and alert. His only complaint (made to me personally) was

that his term as President had obliged him to acquire a hearing aid!

In that year he (with a couple of other enthusiasts — I was one) laboured with pick and shovel to lay out a nature trail in the Coranderrk Sanctuary. This project was undertaken at the request of the Committee of Management of the Sanctuary. The trail may still be there for all I know. Another enterprise in which he concerned himself was the Kalorama Show at which garden grown native plants were prominently featured. This and similar events in other districts set him thinking about bringing together these growers of native plants. In no time the thought had crystallized into action and he gently converted the Club's Wildflower Garden Section into an independent body which he named the Society of Growing Australian Plants. Its first meeting took place in June, 1957. It is worth putting on record that all of the officers of the new society were members of the FNCV. Not only was Arthur Swaby its founder and Organizing Secretary but he produced and edited a printed newsletter. Eleven of these leaflets were issued between January, 1957 and March, 1959. In June, 1961 its place was taken by a roneoed newsletter which continued for eight years during which time Mr Swaby, in recognition of his services to the, by that time, well established and Commonwealth-wide Society, was elected an honorary life member.

In 1968, after having served the Field Naturalists Club with what can only be described as unremitting energy for forty years, he qualified for election as one of its honorary life members. Being then in his 81st year the distinction was, to say the least, well merited. On the occasion of the presentation of his certificate of honorary membership in July of that year, his friend of long standing, J.H. Willis, recounted some of the achievements of the recipient.

I feel honoured to have been invited to dwell upon and, where appropriated even enlarge upon some of them. Along with several others, I have been closely associated with him during the past thirty years and will always recall his self-effacing modesty, his reluctance to pose as an expert in matters in which he was indeed one and his ever-present urge to impart knowledge. Obviously, his vocation was education and, insofar as it affected his fellow members of the Club, he pursued it successfully. My wife and I were among the too few members of the FNCV who attended his funeral.

J. Ros. Garnet.

A recent stranding of the Strap-toothed Whale, *Mesoplodon layardi* (Gray) (Ziphiidae) from Victoria, and a review of Australian records of the species.

BY JOAN M. DIXON*

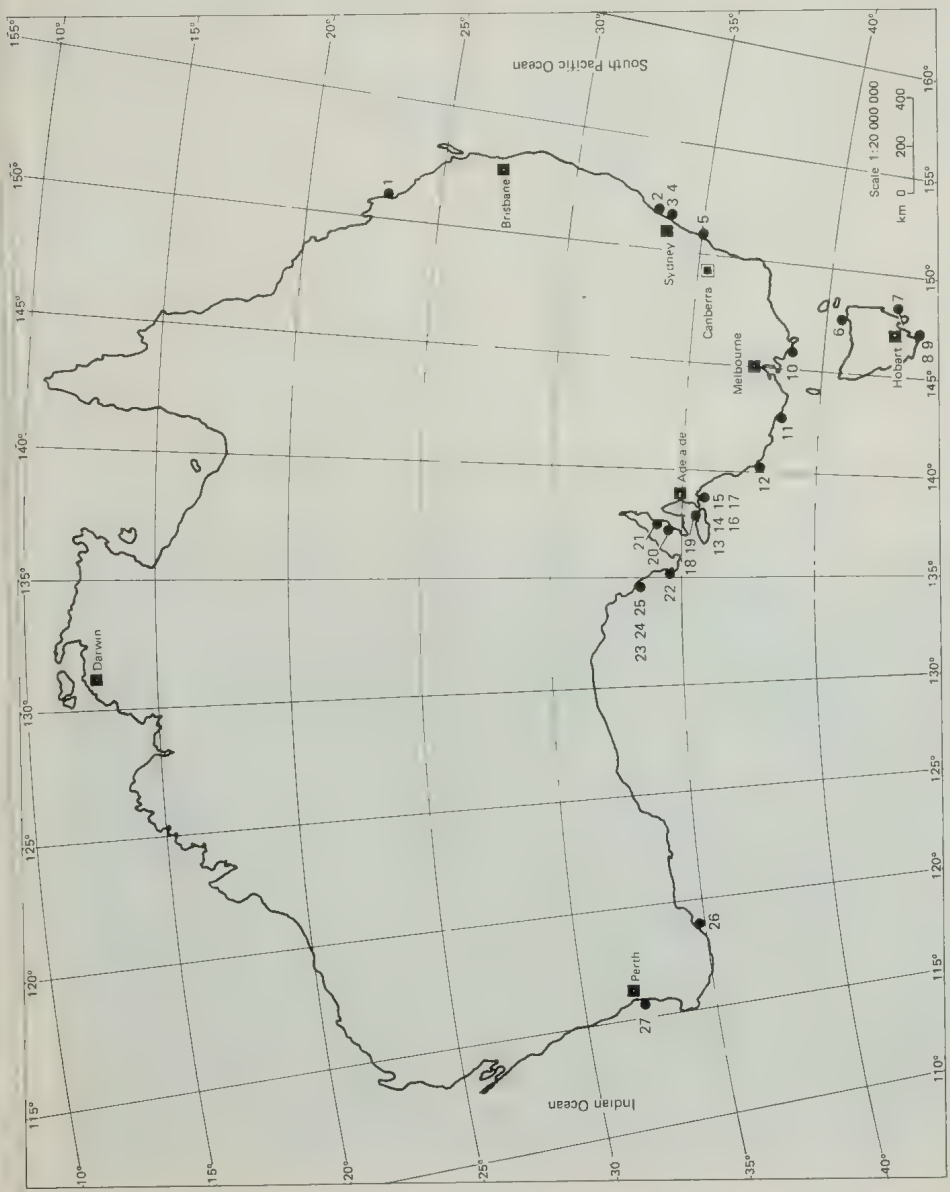
Introduction

Little is known of the biology of the strap-toothed whale *Mesoplodon layardi*. Described by Gray (1865), and known from southern waters only, there are few documented records of this species. Bruyns (1971) mentioned that approximately thirty-seven specimens are known. Gaskin (1968) and Baker (1972) listed nineteen and twenty specimens from New Zealand respectively. The Australian records have never been documented. An investigation of the holdings of the species in Australian museums has revealed the existence of twenty-three specimens from Australia excluding photographs and including the most recent record which is reported here. This specimen is the third record of the species from Victoria and the first male from the State.

*Curator of Mammals, National Museum of Victoria

The family Ziphiidae, commonly known as Beaked Whales, contains five genera and eighteen species. The prominent beak is common to all members of the family, and in most species, the lower jaw which is slightly longer than the toothless upper jaw, has one or two pairs of teeth. These show considerable sexual dimorphism. As a rule they are small or rudimentary in females, and larger and more conspicuous in males of the same species.

Mesoplodon layardi, the strap-toothed whale, was described by J. E. Gray (1865) following observations made by E. L. Layard, Keeper of the South African Museum at Capetown entitled "Notes on Whales of the Cape".



MAP 1. Records of the strap—toothed whale *Mesoplodon layardi* on the Australian coast.

Table 1. Measurements of *Mesoplodon layardi* C 23446 male (in cm).

Total length	552.0
Tip of upper jaw to centre of eye	81.0
Tip of upper jaw to corner of mouth	43.5
Tip of upper jaw to blowhole	70.0
Tip of upper jaw to anterior insertion of flipper	135.0
Tip of upper jaw to tip of dorsal fin	344.0
Tip of upper jaw to centre of anus vent	400.0
Length of flipper from anterior insertion to tip	46.0
Width of flipper	28.0
Width of tail fluke	132.2
Depth of notch in tail fluke	6.0
Height of dorsal fin	31.0
Tooth length (mean)	20.0
Tooth width (mean)	7.5

Measurements made on site by S. Bruton, National Parks Service.

Fig. 1. Stranded *Mesoplodon layardi* male. Discovery Bay, south-west Victoria, C 23446.
Photo: Joan M. Dixon.

Layard forwarded descriptions and drawings made by Mr Trimen of the South African Museum to Gray. The observations together with the accompanying notes were analysed, and the new species from the Cape of Good Hope illustrated by a male skull showing the distinctive elongated strap-tooth with its small apical process.

Known from the South Pacific and Indian Oceans from Australia and New Zealand to the South Atlantic, and between the Falkland Islands and South Africa, this whale species has received little scientific attention. As it travels in small schools and is normally found in deep water, little is known about its migratory pattern.

Discovery Bay Record

The stranding of a male *Mesoplodon layardi* 13 April 1979 approximately 4 km west of Noble's Rocks, Discovery Bay, south-west Victoria, Lat. 31° 05' S, Long. 141° 04' E, was noted and reported to an officer of the National Parks Service, B. Livingston. Following investigations by Portland National Parks Officer, S. Bruton, the specimen grey in colour, was photographed and measured by him 19 April. (Table 1, Figs 1, 2). Badly damaged and covered with numerous scores, it was apparently dead on beaching. Examination was carried out 21 April by the author, assisted by P. Kelly, Fisheries and Wildlife Officer, Warrnambool. By that time, the carcass was in a fairly advanced stage of decomposition, but it was possible to retrieve the severely fractured cranium. The large strap-teeth were intact, and attached to them were a number of stalked barnacles. Posterior portions of both left and right rami were fragmented, the rostrum of the cranium broken, and most of the major bones crushed. The skull was retrieved for subsequent examination, and the post-cranial carcass buried at the site for future reference. Cranial material is now lodged in the National Museum of Victoria, registered number C23446 (Fig. 2). The event was reported to the S.E.A.N. Bulletin (1979).

Fig. 2. Right mandibular tooth from *Mesoplodon layardi* Discovery Bay, C 23446. Photo: F. Coffa.

TABLE 2 RECORDS OF STRAP-TOOTHED WHALES, MESOPLODON LAYARDI FROM AUSTRALIA

Location	Latitude		Longitude		Ref. Map 1	Sex	Date	Source	Reg. No.	Material
Queensland, Rockhampton	23	22	150	31	1	-	18.1.1915	Q'ld Mus.	J2105	Cranium & few vertebrae
New South Wales, about 4 mi N of Broken Bay	33	34	151	18	2	-	7.1923	Aust. Mus.	S1636	Skull
New South Wales, Sydney, Little Bay	33	53	151	13	3	-	1.5.1871	Aust. Mus	358, 359 363, 364	Skeleton Holotype Callidon guntheri
New South Wales, Sydney, Curl Curl Beach	33	55	151	13	4	M	3.4.1962	Aust. Mus	M8229	Skull
New South Wales, Nowra, Abraham's Bosom	34	53	150	36	5	M	1872	Aust. Mus.	360, 362	Skull, few vertebrae, part hyoid
Tasmania, Lefroy, Curry Beach	41	06	147	57	6	M	6.3.1963	Q.V.M.	1963/1/233	Skull (no mandibles)
Tasmania, Frederick Henry Bay, Slopen Is.	42	58	147	39	7	-	2.1966	Tas. Mus.	A740	Skull
Tasmania, south-west, Recherche Bay	43	33	146	54	8	-	7.1918	Tas. Mus.	A739	Skull
Tasmania, south-west, Recherche Bay	43	33	146	54	9	-	winter 1925	Lit. record S & L	D754	Skeleton (articulated)
Tasmania. No further details						-		Tas. Mus. ex Univ. Tas.	-	Skull
Victoria, south-east, Anderson's Inlet	38	39	145	47	10	M	2.1955	S. Archer	-	Photographs "The Age"
Victoria, [illegible], Griffiths Is.	38	24	142	15	11	F	23.6.1962	N.M.V.	C3758	Skull
Victoria, Nelson, Discovery Bay	38	05	141	04	12	M	13.4.1979	N.M.V.	C23446	Skull
South Australia, Encounter Bay, Victor Harbour	35	33	138	33	13	M	3.3.1931	S.A.M.	M2969	Skull
South Australia, Encounter Bay, Victor Harbour	35	33	138	33	14	F	3.2.1931	S.A.M.	-	Photographs
South Australia, Encounter Bay, Victor Harbour	35	33	138	33	15	F	12.1.1939	S.A.M.	M5006	Skeleton
South Australia, Encounter Bay, Victor Harbour	35	33	138	33	16	F	12.1.1939	S.A.M.	M5007	Skull
South Australia, Encounter Bay, Victor Harbour	35	33	138	33	17	F	12.1.1939	S.A.M.	M5008	Skull

South Australia, Kangaroo Island, Rocky Point	35	48	137	50	18	M	13.2.1956	S.A.M.	M6269	Skeleton
South Australia, Kangaroo Island	35	48	138	03	19	-	2.1919	S.A.M.	M794	Skeleton
South Australia, Spencer Gulf, Port Rickaby	34	41	137	30	20	-	12.1929	S.A.M.	M8859	Skull
South Australia, Spencer Gulf, Cape Elizabeth	34	08	137	27	21	M	3.1969	S.A.M.	M8401	Skeleton (part)
South Australia, Coffin Bay Peninsula	34	32	135	15	22	M	2.1933	H.M. Hale	-	Photographs
South Australia, Streaky Bay	32	35	134	03	23	M	14.1.1934	S.A.M.	M4564	Skull
South Australia, Streaky Bay, Wharff's Point	32	35	134	03	24	-	2.2.1939	S.A.M.	-	Photographs
South Australia, Streaky Bay, Wharff's Point	32	35	134	03	25	-	2.2.1939	S.A.M.	-	Photograph.
Western Australia, Cape Riche	34	36	118	47	26	-	1.1.1977	W.A.M.	[illegible]	Skull
Western Australia, Rockingham	32	17	115	43	27	M	21.7.1959	W.A.M.	M4[illegible]	Skull

Abbreviations:

Aust. Mus.	Australian Museum Sydney
N.M.V.	National Museum of Victoria, Melbourne
Q'ld Mus.	Queensland Museum, Brisbane
Q.V.M.	Queen Victoria Museum and Art Gallery, Launceston
S.A.M.	South Australian Museum, Adelaide
S & L	Scott & Lord (1926)
Tas. Mus.	Tasmanian Museum & Art Gallery, Hobart.
Univ. Tas.	University of Tasmania, Hobart
W.A.M.	Western Australian Museum, Perth

Australian Records

The first Australian record of *M. layardi* was made by Gerard Krefft, Curator of the Australian Museum, Sydney in 1871. He reported the stranding of a specimen in Little Bay near Sydney and recognised it as being allied to the genus *Mesoplodon*. As the specimen was a female, Krefft was unaware that it was an example of *M. layardi*, which like other members of the genus shows sexual dimorphism in tooth formation and arrangement, and proposed that it be assigned to a new genus *Callidon* (Krefft, 1871). The complete skeleton was saved, and articulated for display in the Australian Museum, Sydney. In about 1872 a second specimen was collected, from Abraham's Bosom near Nowra, New South Wales. Few details are available, but the specimen was discovered by a bootmaker of Nowra who used one of the teeth in polishing his boots. He showed it to E. P. Ramsay (Curator of the Museum from 1874), who arranged for museum staff H. Barnes and J. A. Thorpe to collect it from the mangrove swamp where it reposed. The skull and some bones were secured as well as the tooth from the shoemaker. The opposite tooth was missing and was replaced by a plaster cast when the specimen was displayed in the gallery of the Australian Museum.

Subsequent collections of stranded specimens and photographic records are listed in Table 2. The distribution of these is shown in Map 1. Literature records exist for a number of these: — Aitken (1971), Flynn (1922), Guiler (1977), Hale (1931), Krefft (1871), Scott and Lord (1927), Wakefield (1967), Warneke (1963).

Records from Australian museums and literature indicate that 28 specimens have been collected or photographed on Australian shores. Of these, 27 specimens with good locality data are shown on Map 1. The main centres of stranding are on the south-east coast, and most records lie close to the major cities. Although it is feasible to spot and record strandings from light aircraft, this has not been a normal recording method. Thus distribution of the species as mapped can be regarded as being distinctly correlated with opportunistic collecting in areas close to state museums.

Aitken (1971) noted that all of the *M. layardi* strandings in South Australia occurred during the summer months. In this present review, it appears that strandings take place in summer as a general rule, and occasionally in early winter.

Records show a peak in strandings from 1930-1940. This may be due to greater emphasis being placed on cetacean strandings in South Australia in that decade, or to an abormally high mortality rate for the species over the period.

Data indicate that more males than females have been stranded — 11 males and 5 females. The sexes of the remaining 13 specimens are not known.

Formation of coastal National Parks hopefully will bring new records to light. A general public awareness of the usefulness of such data is part of the battle in gathering scientific information on this and other species whose biology is little known.

Acknowledgements

Thanks are extended to officers of State Government departments for their prompt notification of this stranding and for general assistance. To the Curators of Mammals in other museums, I am grateful for the records they supplied from collections in their care — Mr P. Aitken, South Australian Museum, Mr A. P. Andrews, Tasmanian Museum and Art Gallery, Mr R. Green, Queen Victoria Museum and Art Gallery, Dr D. Kitchener, Western Australian Museum, Mr B. Marlow, The Australian Museum, Dr. R. Molnar, Queensland Museum. Mr J. L. Bannister, Director of the Western Australian Museum and Dr. J. Ling, Director of the South Australian Museum also assisted with records. Dr. E. R. Guiler of the University of Tasmania provided useful information on strandings of *Mesoplodon layardi* from that state. Wendy Probert assisted with collation of records, Dianne Stephens with mapping, Frank Coffa with photography, and Judith Freeman typed the manuscript.

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Field Naturalists Club of Victoria

Reports on FNCV Activities

General Meeting — Monday, 10 December, 1979.

The meeting began with a minute's silence being observed for the late Mr Arthur Swaby, who died in October. Mr Garnet spoke in detail of Mr Swaby's contribution to natural history. Mr Swaby was a teacher by profession, and during his term as Principal of Horsham Primary School he was responsible for much research on the flora of the Little Desert and the Wimmera. He regularly contributed to the Naturalist and exhibited at meetings. His participation in the FNCV was considerable, having held the offices of Honorary Secretary and Librarian, Vice-President and President of the Council, and having been a foundation member of the Botany Group. Mr Swaby was made an Honorary Member in 1968.

The speaker for the evening was Mr Alex Mitchell, Chairman of the Soil Conservation Authority, whose subject was the causes and control of soil erosion in the Victorian alps. The alpine area is a vast and important water catchment. Conservation measures are necessary if the perreniality of water flow is to be ensured and if the dependent aquatic vegetation and other forms of life are to be maintained. Control measures have been introduced with regard to grazing animals, in particular cattle, which have caused a great amount of damage by both grazing and trampling. Many native plants are re-establishing themselves — but this is a slow process. Mr Mitchell illustrated his address with a number of excellent slides.

Among the correspondence tabled was a letter from Elsa Swan of the Bird Observers Club, expressing concern regarding a proposed housing development on the east of Lake Tyers.

The centenary sub-committee reported on the calendar of events for the centenary year, which is to be included in the January/February Naturalist.

Under the microscope were Mr McInnes' exhibits of Wolffia and liverworts. Mr Baker had a number of pyrite exhibits, among which were some crystals from Italy, and graptolites and an ammonite which had been replaced by pyrite. The Lake Mountain excursion provided Dr Smith with molluscs which he exhibited: *Cystopelta petterdi, Rhtyida* sp. and *Glacidorbis hedleyi.* Dr Smith also reported that he collected a carnivorous snail on this excursion.

The Secretary, Miss Wendy Clark, presented the idea and general outline of a series of study trips and camps which will be additional to other FNCV activities. This idea stemmed from Miss Helen Aston's address in October, and it is aimed at the young and active. Details of these trips will be reported in the Naturalist.

Centenary Meeting

As there is very limited seating available for the centenary meeting to be held on 5 May, 1980, would those members who definitely intend to attend please contact the Secretary, Miss W.Clark, 27 Rangeview Grove, North Balwyn, 3104. (859 8091)

FNCV Subscriptions for year 1980 are now due and payable from 1st January 1980

The correct subscriptions to be paid are shown on the outside back cover of this journal. Please check your subscription rate.

Please post your subscription promptly to FNCV Subscription Secretary, 21 Smart Street, Hawthorn, 3122.

Australian Natural History Medallion Fund

Amount on hand invested October 1979	$842.00
Miss M. McLaren (2nd Donation)	40.00
Total November 1979	$882.00

(Continued from page 2).

older members to get together again. So come for the day or call in for an hour or so. There will be a coach from Batman Avenue at 9.30 a.m., fare $5.00, and a meeting place at Whittlesea School at approximately 11.30 a.m. for members going by car. Members can go direct any time to the property which is in Bruce's Creek Road, Whittlesea.

Special Study Trips:

Sunday, 17 February. Marine excursion to Flinders led by Dr Brian Smith. Meet at 9.00 a.m. at the Dandenong Railway Station to arrange transport. Then at 11.00 a.m. meet at Crib Point (near the cross-roads). We will be investigating and comparing the foreshore and the rock platform. Bring sandshoes, hat, container, hand lens, plastic strainer, insect repellent and lunch. Conclusion of excursion subject to tide times.

Saturday, 15 March — Sunday, 16 March. Reptile camp to Mt Baw Baw. Leader: Mr Anthony Sokol. On Saturday, meet at 9.30 a.m. at Lilydale Station to arrange transport; and then at 11.30 a.m. meet at Tanjil Bren Post Office, and drive to camp site. The afternoon will be spent investigating the reptiles of the foothills. On Sunday, the reptiles of the Baw Baw Plateau will be investigated. Conclude approximately 4.30 p.m. Bring enough food and equipment for 2 days, all camping equipment, adequate clothing and water. Contact Wendy Clark for all enquiries, 859 8091 (AH).

Saturday, 19 April. Birds of the Lerdederg Gorge. Leader: Mr Rex Cuningham. Meet at 7.45 a.m. sharp in Batman Avenue to arrange transport. Then at 9.00 a.m. meet in the carpark at Lerdederg Gorge and walk in to observe birds. The geology of the area will be investigated during the walk. Conclude approximately 5.00 p.m. Bring binoculars, notebook and pencil, and lunch. Contact Wendy Clark for all enquiries, 859 8091 (AH).

Sunday, 18 May. Cryptozoic life in Toolangi. More details in the next issue.

Preliminary notices:

Saturday, 1 November — Saturday, 8 November. Wilson's Promontory. At time of writing there are still some vacancies for this excursion, details of which are in the last Naturalist. Deposits should be sent by the end of March and those who intend camping are asked to inform the Excursion Secretary.

GROUP MEETINGS

All FNCV members are invited to attend any Group Meeting; no extra payment.
At the National Herbarium, The Domain, South Yarra at 8.00 p.m.

First Tuesday in the month — Mammal Survey Group.

Tuesday, 4 March. Annual General Meeting of the Group.
Speaker: Lindie Lumsden on Identification of Kangaroos.

Tuesday, 1 April. Identification of Bandicoots.

Third Wednesday in the month — Microscopy Group

Wednesday, 20 February. Members exhibits and discussion of programme for year.

Wednesday, 19 March. Introduction to the microscope. Display of microscope home made to research models. The type of microscope most suited to your needs. Half hour members exhibits.

Wednesday, 16 April. Basic transmitted lighting (the Kohler system). Phase contrast. Oblique lighting and modulation lighting. Incident light versions of each. Half hour members exhibits.

Second Thursday in the month — Botany Group

Thursday, 14 February. Members night.

Thursday, 13 March. Trip through the Big Desert. Speaker: Bruce Fuhrer.

Thursday, 10 April. Australian alpine flora. Speaker: Mr Bleakley.

Thursday, 8 May. Natural history of Kwangsi Area, South China.
Speaker: Dr Elizabeth Turner.

At the Conference Room, the Museum, Melbourne at 8.00 p.m.
Good parking — enter from Latrobe St.

First Monday in the month — Marine Biology and Entomology Group

Monday, 3 March. "The evolution of molluscs." Dr Brian Smith.

Monday, 7 April. Easter Monday. No meeting.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions.

Botany Group

Saturday, 16 February — Sunday, 17 February. Board of Works Thomson River excursion. Private transport to Erica, lunch, dinner, bed and breakfast $12.50. Fee includes conducted tour on Saturday afternoon and accommodation. Book with Miss Allender (527 2749).

Saturday, 22 March. Please note not last Saturday. Mt Macedon. Leader: Pat Carolan — Eucalypts.

Saturday, 26 April. Coranderrk, near Healesville.

Saturday, 31 May. Upper Pakenham ferns and fungi.

Day Group — Third Thursday in the month

Thursday, 21 February. Fitzroy Gardens. Meet outside the tea rooms at 11.30 a.m.

Thursday, 20 March. Blessington Street Rose Garden, St Kilda. Meet at the corner of Brighton Road and Mozart Street at 11.30 a.m. Carnegie tram (no. 67) from Swanston Street to Mozart Street (stop no. 34) or Prahran trams (nos. 77 & 78) to Dickens Street (stop no. 34). Leader: D. McInnes. Phone 211 2427.

Thursday, 17 April. Puffing Billy to Emerald. Leave Belgrave at 11.55 a.m. A connecting train from Flinders Street Station leaves at 10.15 a.m. Return from Emerald at 1.35 p.m. to arrive at Belgrave at 2.05 p.m. Leader: I. Gillespie. Phone 578 1879.

Thursday, 15 May. Carlton walk. Meet at the Royal Society of Victoria, 9 Victoria Street, main entrance opposite the Carlton Gardens, at 11.30 a.m. Leader: C. Gill. Phone 836 8016.

Mammal Survey Group

For excursion details contact Ray Gibson (874 4408)

March, 8, 9, 10 (Labour Day Weekend) Strathbogie area.

April 4 to 7 (Easter Camp) Strathbogie area.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora
Members include beginners as well as experienced naturalists.

Patron:

His Excellency the Honorable Sir HENRY WINNEKE, K.C.M.G., O.B.E., Q.C

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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 14 April, 8.00 p.m.
Speaker: Dr B.R. Wilson, Director, National Museum of Victoria.
Subject: Aspects of marine life.
(This is one of the special meetings of this Centenary year.)

Monday, 5 May — CENTENARY MEETING — **7.45 p.m.**
State Film Centre, 1 MacArthur St.
In the presence of His Excellency Sir Henry Winneke, Governor of Victoria, Patron of the F.N.C.V., and Lady Winneke.
Speaker: Dr J.H. Willis.
Please be seated by 7.55 p.m.

Monday, 12 May, 8.00 p.m. — Annual General Meeting
Programme hosted by Botany Group.

Monday, 9 June, 8.00 p.m.
Programme hosted by Microscopy Group.

New Members — March/April General Meetings

Ordinary

Miss Margaret A. Arnold, 238 Amess St, North Clayton, Vic. 3054.
Miss Johane Bull, 68 Brunning St, Balaclava, Vic. 3183.
Miss Kathleen Fox, 22 Elstone Ave, Niddrie, Vic. 3042.
Mr J.C. Goodman, 8 Perry St, Williamstown, Vic. 3016
Mrs Ruth Graves, 3 Palome St, North Oakleigh, Vic. 3167.
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Miss Robyn McKechnie, 47 Delhi Court, Flemington, Vic. 3031.
Mrs. M. Pearl, 1 Dean Ave, Mount Waverley, Vic. 3149.
Mr D. Pinczower, 4/47 Carlyon St, Ormond, Vic. 3204.
Miss Jean H. Warming, 3/39 Oswald St, Gardenvale, Vic. 3185.
Mr Tony Valante, Dept. of Zoology, La Trobe University, Bundoora, Vic. 3083.

Joint

Mr Paul Temple & Mrs Andrea J. Temple, 53 Rowans Rd, Highet, Vic. 3190.
Mr & Mrs N.J. Wilson, 4 Chatham Rd, Canterbury, Vic. 3126.
Mr & Mrs R.J. Carstairs, 13 Jacka Crescent, Campbell, A.C.T. 2601.

Country

Mrs B. Triggs, "Dead Finish", Genoa, Vic. 3889.
Mr K.G. Rock, P.O. Box 97, Packenham, Vic. 3810.

FNCV EXCURSIONS

Sunday, 4 May. Centenary picnic — Bruce's Creek, on the property of Mr Alan Parker. This adjoins State forest with good walks, and is next to a scout camp, the buildings of which will be available if the weather is bad. There is scope for the active, and also an opportunity for older members to get together again. So come for the day or call in for an hour or so. There will be a coach from Batman Avenue at 9.30 a.m., fare $5.00, and a meeting place at Whittlesea School at approximately 10.30 a.m. and 11.30 a.m. for members going by car. Members can go direct any time to the property which is in Bruce's Creek Road, Whittlesea.

Sunday, 1 June. General excursion to Doongalla Estate. Meet at 9.30 a.m. at Batman Avenue. Fare $5.00. Bring a picnic lunch.

Sunday, 6 July. General excursion, "Building stones of the city". Leader: Mr Graeme Love.

(Continued on page 87)

The Victorian Naturalist

Volume 97, Number 2 March/April, 1980

Centenary Year 1880–1980

Editor: Robert L. Wallis
Editorial Committee: H. Cohn, M. Corrick, R. Kent, B. Smith

Cover illustration (Photo N. Rosengrew).
An air oblique photograph of the north-western corner of French Island showing the sector of mangrove die-back near Scrub Point.

Mangroves and Coastal Morphology

BY E. C. F. BIRD*

Mangrove vegetation occupies the upper inter-tidal zone on the shores of estuaries, lagoons and embayments, especially on tropical coasts, but also extending into the temperate zone. In Victoria, where mangroves reach their southernmost limit in Corner Inlet, only one species (*Avicennia marina* (FORSK.) VIERH. var. *resinifera* (FORST.f.) BAKH.) is present. This grows extensively on the shores of Westernport Bay, Anderson Inlet, and Corner Inlet, and is also found at Limeburner's Bay and Barwon Heads, near Geelong, with minor occurrences near Williamstown and in Shallow Inlet (Ashton 1972).

The geomorphological role of mangrove vegetation has been the subject of considerable discussion. The question is whether mangroves promote sedimentation, and thereby shape depositional landforms that would not otherwise have developed, or whether they merely occupy sites that are ecologically suitable, moving in to colonise (and possibly thereafter to stabilise and protect) an inter-tidal morphology that would have developed independently in their absence. Some have followed Davis (1940) in supposing that mangroves bring about coastal progradation (the seaward advance of depositional land) by spreading forward over mudflats in the inter-tidal zone and trapping sediments. Others have pointed out that mangroves can only advance after the inter-tidal zone has been built up by sedimentation to a level suitable for their colonisation, so that the spreading mangrove fringe is a consequence, rather than a cause, of coastal deposition (Scholl 1968).

*University of Melbourne

Accepting the latter view, the question remains of whether mangroves, once established, promote patterns of sedimentation that would not otherwise have developed. A decade ago, the present author examined this question by means of repeated surveys and experimental work on the shores of Westernport Bay close to the boat harbour at Yaringa, which was excavated in 1967. Here *Avicennia marina* forms an outer fringe 100 to 150 metres wide in front of a salt marsh 200 to 300 metres wide, backed by a thin *Melaleuca ericifolia* zone, then bushland on sandy terrain (Fig. 1). At the highest tides the whole of the mangrove and salt marsh area is submerged, while at low spring tides extensive mudflats, bearing only a sparse cover of seagrasses (*Zostera* spp.) are exposed seaward of the mangrove fringe. Transverse profiles show that the salt marsh occupies a depositional terrace built up to high spring tide level, the mangrove zone occupying a seaward slope that declines towards mid-tide level, the mudflats exposed at low spring tides having a very gentle transverse gradient.

Measurements of accretion over marker layers of brick dust in the mangrove zone, and of changes of level on stakes implanted in the mudflats, showed sustained, if intermittent, accretion within the mangroves of up to 1.5 cm/yr, and irregular gains and losses of up to 8 cm/yr out on the more mobile mudflats. It was deduced that the mangroves were trapping muddy sediment washed into their sheltered environment by waves and rising tides, sediment that would have remained mobile, moving to and fro over the inter-tidal zone if it had not been thus intercepted. Accretion beneath mangroves is facilitated by the dense

Fig. 1 — An air oblique photograph of the north-western shores of Westernport Bay at Yaringa

networks of pneumatophores, 'breathing-tubes' that project vertically from sub-surface root systems (Fig. 2); in addition, the mangroves augment accretion by producing organic materials (leaves, twigs, root remains) that become incorporated in the accumulating sediment. In these ways, *Avicennia marina* was seen to be shaping the depositional terrace and building it up to high spring tide level, whereupon the mangroves were being replaced by *Arthrocnemum halocnemoides*, *Salicornia quinqueflora*, and other species of the salt marsh community. Thus in Westernport Bay, mangroves were acting as land-builders (Bird 1971).

Subsequent work in Cairns Bay, north Queensland, led to a similar conclusion with respect to the pioneer mangroves, *Avicennia marina* and *Sonneratia alba*, which there initiated the building of a depositional terrace upon which they were succeeded first by other mangroves, notably *Rhizophora* spp.

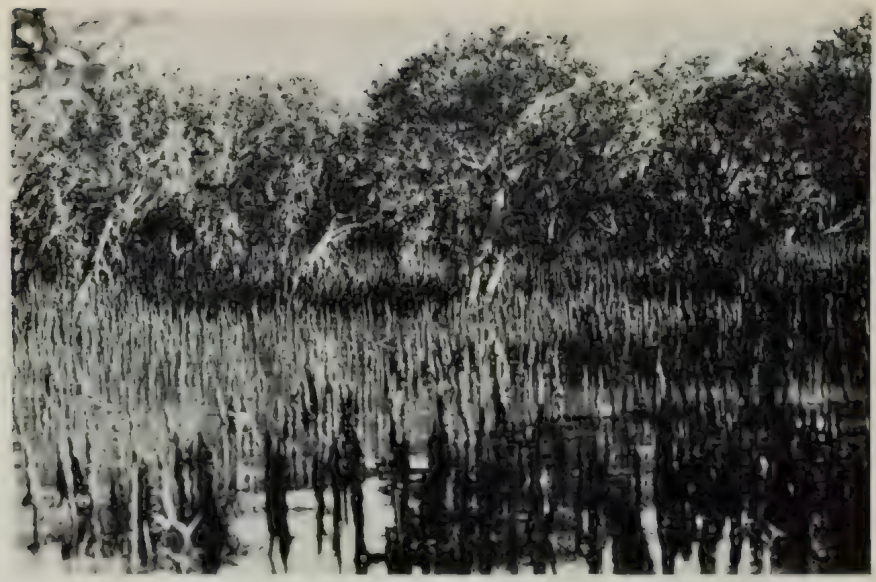


Fig. 2 — Pneumatophores under mangroves at Yaringa

and *Bruguiera* spp., and then by salt marsh or swamp forest communities (Bird 1972). It was noted that the pioneer *Avicennia* and *Sonneratia* species both had pneumatophore networks serving to trap drifting sediment. Other mangroves, such as the prop-rooted *Rhizophora* spp. or the knee-rooted *Bruguiera* spp., might have been less effective in trapping sediment on the seaward fringe.

Such considerations call into question generalisations on the geomorphological role of mangroves. Moreover, the effectiveness of the different mangrove species as land-builders may vary with such factors as tide range, wave exposure, and abundance of sediment supply. Much of the literature on the geomorphological role of mangroves has come from the coast of Florida where the tide range is small, wave action generally weak, and sediment supply meagre. Unfortunately, the reports from the Caribbean consist of opinions based on casual observation of mangrove systems, rather than the detailed surveys, field measurements, and monitoring of changes necessary for a scientific assessment.

Since 1971, surveys and measurements have continued at Yaringa and elsewhere around Westernport Bay, where the history of shoreline changes during the past century has been documented (Bird and Barson 1975). The conclusions of the 1971 paper stand, but some refinement is now necessary to give a more accurate picture of geomorphological changes associated with mangrove growth in this area. In order to avoid too much repetition, the following account should be read as a sequel to the *Victorian Naturalist* paper published in July 1971 (Volume 88, pages 189-197).

Marsh Encroachment

To the rear of the salt marsh around Westernport Bay it is often possible to trace an old sandy beach, thought to mark the position of the shoreline when the Holocene marine transgression brought the sea up to this level between 5000 and 6000 years ago. At that stage there was no marshland at Yaringa, so that at high tide the waves washed on to a sandy shoreline. In some places, as at

Fig. 3 — Advancing mangrove fringe, with *Avicennia* seedlings spreading forward on to mudflats

Bungower Point, north of Yaringa, it is possible to find relics of recurved sand spits that formed at this stage, and are now enclosed by marshland.

Muddy deposits then began to accumulate in front of the sandy shoreline. The muds consist primarily of clay rather than silt (Marsden and Mallett 1975), and are derived partly from sediment washed into Westernport Bay by rivers, and partly from material scoured from the weathered mantle of rock formations that outcrop in bordering cliffs and shore platforms, and on parts of the bay floor. The river input may have been small, for apart from Bass River which flows into the south-east of the bay, most of the hinterland drainage filtered in through broad freshwater swamps that intercepted much of the fine-grained sediment load. Nevertheless, some of this clay was released as the Holocene sea transgressed the swamps in the northern part of the bay where the low cliffs of black swamp clay between Yallock Creek and Lang Lang beach are still being eroded (Miles 1976). Another important source of clay was the weathered mantle of the Older Basalts, which outcrop on the coast between Flinders and Somers, on Phillip Island and the southern shores of French Island, and at Corinella. This fine-grained sediment, together with organic material derived from estuarine fauna and plant remains, has been concentrated in the northern part of the bay by waves and tides, the tide range here attaining at least 3 metres. It forms a complex inter-tidal topography, with a variable cover of seagrass vegetation, and is traversed by deeper channels diverging from a north-eastern tidal watershed. Detailed examination shows that thin sheets of mud, in places sandy, migrate across the seagrass mudflats, especially during episodes of strong wave action at high tide. Some of the sediment moves onshore, to be incorporated in the depositional terrace developed under the bordering mangrove and salt marsh communities.

This terrace was initiated when mangroves colonised muddy areas in front of bordering sandy shorelines. Swamp encroachment ensued, the

mangrove fringe advancing seaward as it trapped sediment and built up the terrace to high spring tide level, when succession to salt marsh took place. When Westernport Bay was first mapped, by George Smythe in 1842, much of its northern shoreline, from Sandy Point around to the Bass River, had developed a mangrove-fringed salt marsh terrace. A similar feature extended around much of French Island, except on the rocky promontories of its southern coast, and mangrove-fringed salt marshes also extended along inlets and embayments on the eastern coast of Phillip Island. Under these conditions, the sediment-trapping *Avicennia* fringe was either stable or advancing gradually seawards.

Where the mangrove fringe is advancing, the canopy declines seaward to a fringe of seedlings (Fig. 3) but where the trunks of the mangroves are exposed on the seaward margin, the fringe is either stable or receding (Fig. 4), obvious recession being marked by dying or falling trees. Only a very small proportion of the mangrove fringe in Westernport Bay shows an advancing aspect: almost invariably, the seaward margin is abrupt, with trunks exposed.

Historical Changes

Most of the features mapped by Smythe in 1842 persisted in 1865, when Cox charted Westernport Bay, but the mangrove fringe has since been much reduced by clearance, reclamation, drainage works, and die-back. It had become intermittent by the time air photographs were taken in 1939, and there have since been further changes, including some areas of mangrove recovery (Bird and Barson 1975). Fig. 5 shows the present pattern of shoreline features, including the mangrove-fringed salt marsh sectors.

Changes have taken place at Yaringa over this period. On Smythe's map and Cox's chart the Yaringa coast is shown as mangrove-fringed salt marsh, but air photographs taken in April 1939 show that the mangrove fringe had become sparse, with only scattered *Avicennia* bushes in front of a salt marsh margin that appears to be undergoing erosion. Subsequently, the mangrove fringe has regenerated, and if it were not for the

Fig. 4 — Mangrove fringe truncated by erosion, so that trunks of mature *Avicennia* are exposed

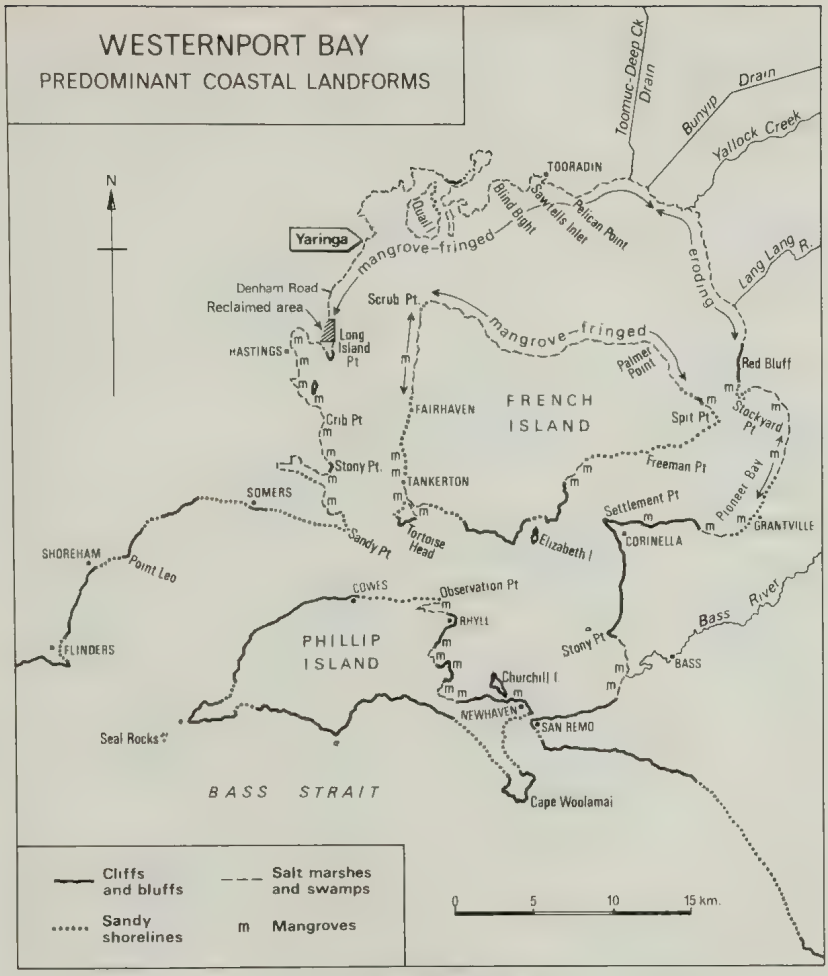


Fig. 5 Westernport Bay

sites elsewhere, notably at Denham Road to the south, where the mangrove fringe is still sparse.

The site where measurements of accretion were made in the nineteen-sixties was therefore one of secondary recolonisation by mangroves rather than primary encroachment. The substrate off this sector is a 'wave-cut platform' in the relatively firm compacted clay that had previously accumulated under a mangrove cover, a platform cut during the phase when the mangrove fringe was depleted. It contrasts with the very soft muddy sediment found off mangroves evidence on the 1939 air photograph it would be difficult to detect that this sequence had taken place. The die-back of mangroves in the nineteen-thirties is not fully understood, but is thought to be the outcome of a freshwater influx resulting from the extensive river flooding that occurred in the Koo-wee-rup swamp area to the north during that decade, and the outpouring of water from drainage channels cut through to the northern shore. Erosion must have been brief at Yaringa, for the salt marsh to the rear shows little evidence of the cliffing which is prominent in similar

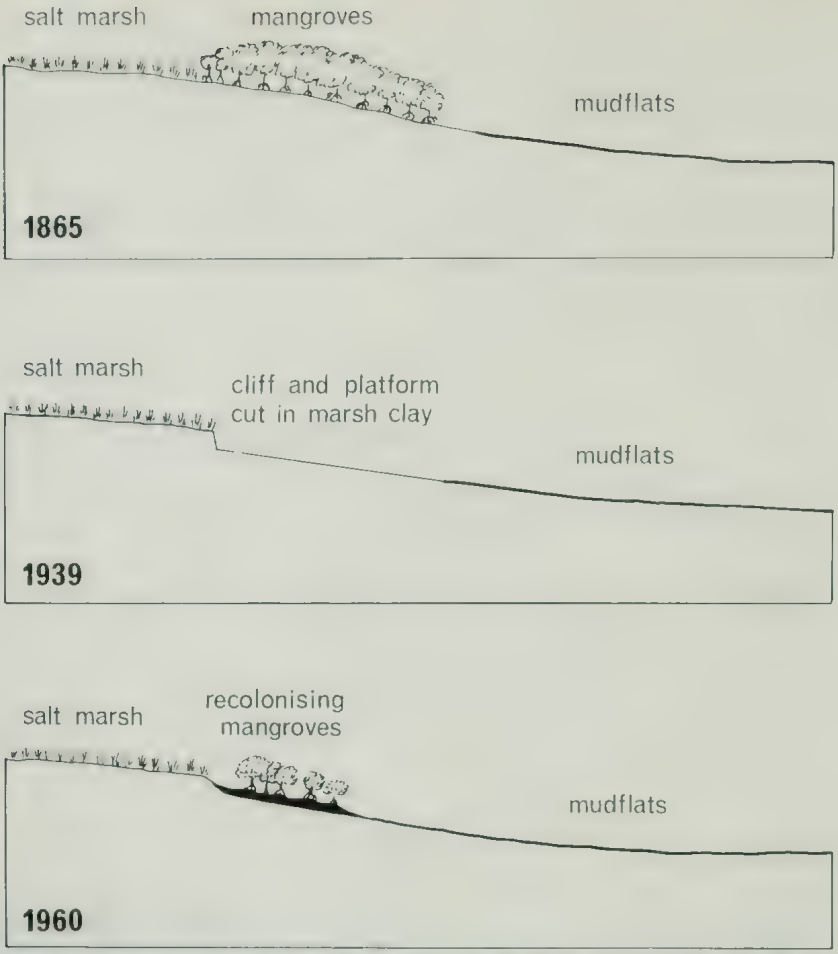


Fig. 6 — Sequence of changes at Yaringa since 1865, showing the loss of the mangrove fringe by 1939 and its revival subsequently

where primary colonisation is in progress, as at the head of Watson's Inlet, to the north of Yaringa, where seedling advance is initiating the progradation, as well as the vertical accretion, of a bordering salt marsh terrace. The revival of mangroves at Yaringa has not been by simple encroachment, but rather by spreading around the older plants that persisted in 1939 and provided seedlings. Several older mangroves can still be found, with trunks up to 20 cm in diameter; and since they were already mature plants in 1939 they must now be much more than 40 years old.

The sequence of mangrove loss and regeneration is shown in Fig. 6. The intermediate stage can be seen at Denham Road, where the mangrove fringe shown on the early maps and charts had almost completely disappeared in 1939, and has only partially revived. The effects of dieback and reduction of the former mangrove fringe can also be seen at Scrub Point, on the north-western shore of French Island (Fig. 7 — cover illustration), and here it is possible to compare the longitudinal and transverse profiles of adjacent sectors, one with a mangrove-fringed salt marsh terrace,

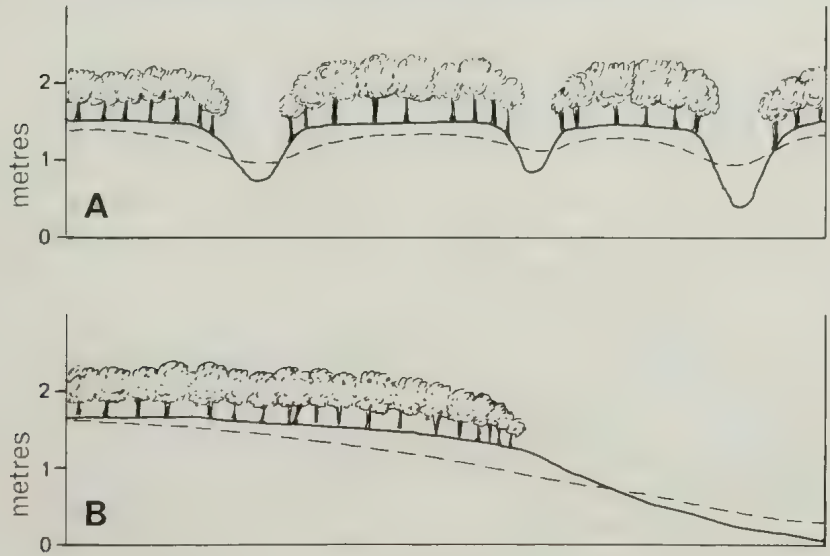
the other having lost its mangrove cover (Fig. 8). It is evident from this comparison that sectors occupied by mangroves have substrates built up to a higher level by sedimentation, the creek systems being well-defined, and relatively narrow and deep. Where the mangroves have disappeared, the substrate is lower, and the creek channels are wider and shallower. The evidence from Yaringa suggests that if the mangrove cover were now to revive at Scrub Point the substrate would again be built up, and the creeks would narrow and deepen. The contrast is a measure of the extent to which mangroves have shaped the inter-tidal profile.

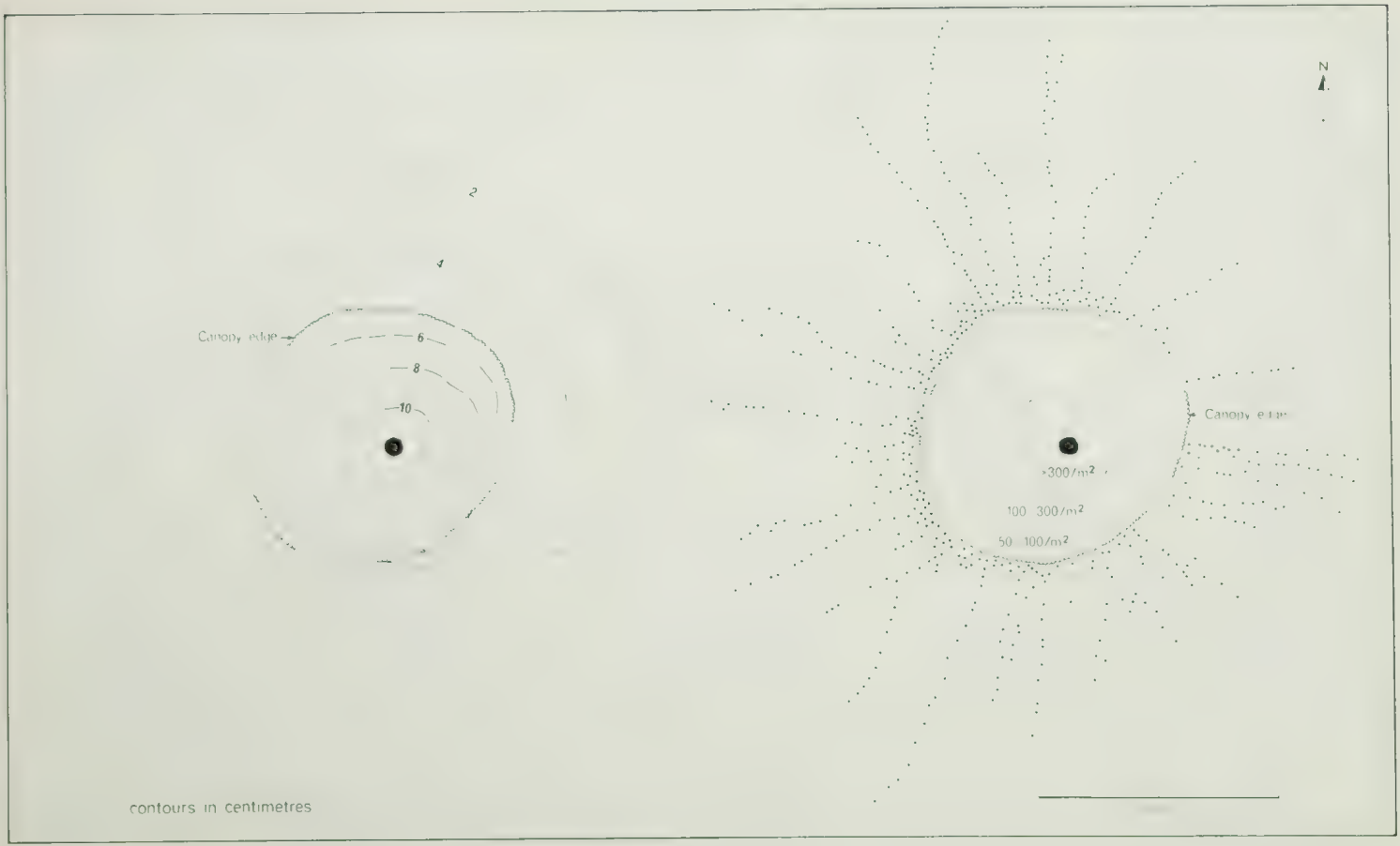
Effects of Pneumatophores

Emphasis has been given to the role of pneumatophores in trapping sediment and facilitating accretion on mangrove substrates. There is a slight rise (5 to 10 cm) in the level of the substrate at the outer edge of the mangroves, where the pneumatophore network extends on to the adjacent mudflats; a rise that correlates with the pattern of mangrove trunks and pneumatophores. At Denham Road, isolated mangrove bushes with well-developed radial networks of pneumatophores (Fig. 9) are accompanied by a slight rise in substrate level within the pneumatophore system, and to the lee of the plant i.e. to the north-west, prevailing onshore winds and waves here being from the south-east.

The same effect has been demonstrated experimentally by inserting a network of pegs spaced at 5 cm intervals along each of sixteen metre-long lines radiating symmetrically from a central pole to simulate a pneumatophore system. One experiment resulted in up to 0.3 cm of mud accretion over a sandy substrate within such a network during a period of one month, and when the pegs were removed this accretion dispersed (Bird 1971, p. 195). Spenceley (1977) conducted similar experiments at Magnetic Island in Queensland, and found variations related to the spacing of the pegs. A grid

Fig. 8 Comparison of profiles parallel and transverse to the shoreline on vegetated mangrove areas (solid line) and on adjacent sectors where the mangrove cover is no longer present (pecked line)




2
4
Canopy edge
6
8
10
N
Canopy edge
>300/m²
100 300/m²
50 100/m²
contours in centimetres

of pegs spaced at 10 cm intervals had little effect on sedimentation, but grids at 5 cm and 2.5 cm intervals showed accretion after initial erosion, and grids at 1 cm intervals showed scour, evidently because they intensified through-flowing currents. On the shores of Magnetic Island, *Avicennia* pneumatophores have an average spacing of 2.26 cm within a metre of the trunk, widening to 5.96 cm more than 3 metres from the trunk. Although his short-term experiments showed that accretion was greater, and alternations of cut and fill less, within pneumatophore systems than on unvegetated mudflats, Spenceley considered that the stability of substrate under mangroves was due mainly to the binding effects of small rootlets.

Under *Avicennia* in Westernport Bay such rootlets are very sparse, and cannot have had much effect on sedimentation. At Yaringa, the mangroves have a dense network of pneumatophores rising from intersecting root systems. Typically, there are about 300 pneumatophores per square metre, rising to more than 400 towards the trunks, and thinning out along incipient creek channels. The substrate has an irregular relief, slightly higher in the vicinity of the mangrove trunks, and made hummocky by crab burrowing. The contribution of rootlets to the trapping and stabilisation of sediment is minor compared with the effects of pneumatophores: as waves and currents flow into the pneumatophore invironment they quickly face away, and the suspended sediment load is jettisoned.

Conclusion

Further studies in Westernport Bay have substantiated the conclusion, reached previously (Bird 1971, p. 197), that mangroves were trapping sediment and acting as land-builders. More intensive investigation has shown that the mangrove fringe where accretion rates and patterns were monitored was in fact an area of mangrove revival rather than initial encroachment. Generalised statements about the geomorphological effects of mangroves are unreliable, because of variations related to the structure of mangrove species and the environments within which they occur. The present work has shown that *Avicennia marina*, growing on the muddy shores of Westernport Bay in areas where the mean spring tide range is about 3 metres and where wave action is generally weak, has acted as a sediment-trapping agent in such a way as to prograde and build up a depositional terrace in the upper part of the inter-tidal zone; a terrace on which it gives place to salt marsh communities. Where *Avicennia marina* has died back, or been removed, this depositional terrace has been lowered and cut back by wave and current scour to form a more subdued topography; and where it has subsequently regenerated, the depositional terrace is being rebuilt. It is deduced that this mangrove has been an agent of land-building in the shore environment of Westernport Bay.

Acknowledgements

I am grateful to Robert Bartlett for preparing the diagrams, to Neville Rosengren (Figs. 1 and 7) and Ken Pohlner (Figs. 3 and 4) for providing photographs.

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Tuan Predation by Powerful Owls

By S. Van Dyck* and D. Gibbons†

The tuan or brush-tailed phascogale *Phascogale tapoatafa* has not previously been found in the macerated array of fauna represented in the regurgitated pellets of powerful owls *Ninox strenua*. Common ringtails *Pseudocheirus peregrinus* and greater gliders *Schoinobates volans*, on the other hand are usually major components. This is not surprising if those aspects of behaviour which reflect "catchability" of these species are considered. The larger, slower possums should be easy prey. The tuan, with its explosive disposition '. . . performing lightning sprints up and down eucalypt trunks, "corkscrewing" round the boles to avoid observation, watching head downwards, or bounding squirrel-like from tree to tree' (Fleay 1949 p. 118) should be a relatively difficult mark. However the examination of powerful owl pellets collected recently from Mt Alexander, central Victoria, has shown that for at least part of the year, tuans rank highly as preferred prey items in the diet of a resident pair of powerful owls.

According to Seebeck (1976) and Fleay (1968) powerful owls from Victoria to Queensland show a definite preference for large, slow moving prey items such as ringtails and greater gliders. This preference accounts for the uncommon occurrence of sugar gliders *Petaurus breviceps* in powerful owl pellets from Victoria (Seebeck 1976).

The representation of fauna in the Mt. Alexander pellets highlights the opportunistic nature of powerful owls and sheds light on the strategies they employ in areas where the 'preferred' large prey items are absent.

Study Area

A pair of powerful owls was located roosting in a radiata pine *Pinus radiata* plantation situated on the eastern side of Mt. Alexander state forest (37° 00' S 144° 18' E), 5 km SE Harcourt, central Victoria. The entire mount occurs on a bedrock of granodiorite and the small plantation is surrounded by semi-open forest dominated by manna gum *Eucalyptus viminalis*. This species occurs in mixture with messmate *E. obliqua* on the ridgetops, with long-leaf box *E. goniocalyx* on the northern and western slopes and yellow box *E. melliodora* and river red gum *E. camaldulensis* on the lower slopes.

The depth of cover and availability of numerous, suitable roosting sites in the pine plantation made pellet collection difficult. There appeared to be little preference for particularly favoured roosts and many pellets had disintegrated prior to collection.

Pellet analysis and results

After a preliminary collection in early May 1979, pellets for each month were

*Queensland Museum
†20 Jacob St, Bendigo

TABLE 1

Prey species found in powerful owl pellets
during the months June to September 1979

	collected 7 June 1979							collected 26 July 1979							collected 15 August 1979							collected 30 September 1979						
	MAMMAL					BIRD		MAMMAL					BIRD		MAMMAL					BIRD		MAMMAL					BIRD	
MAMMALS	right dentary	left dentary	right maxilla	left maxilla	fur	left humerus	right humerus	right dentary	left dentary	right maxilla	left maxilla	fur	left humerus	right humerus	right dentary	left dentary	right maxilla	left maxilla	fur	left humerus	right humerus	right dentary	left dentary	right maxilla	left maxilla	fur	left humerus	right humerus
Sugar glider Petaurus breviceps	5	4	3	1	+			13	13	3	3	+			3	1	3	1	+			3	3	3	3	+		
Tuar Phascogale tapoatafa	5	5	3	4	+			1	1	1		+										1	1		1			
Brush-tail possum Trichosurus vulpecula															1				+			1	1	1	1	+		
Rabbit Oryctolagus cuniculus					+																							
BIRDS																												
Magpie Gymnorhina tibicen						1							6	6						8	6							

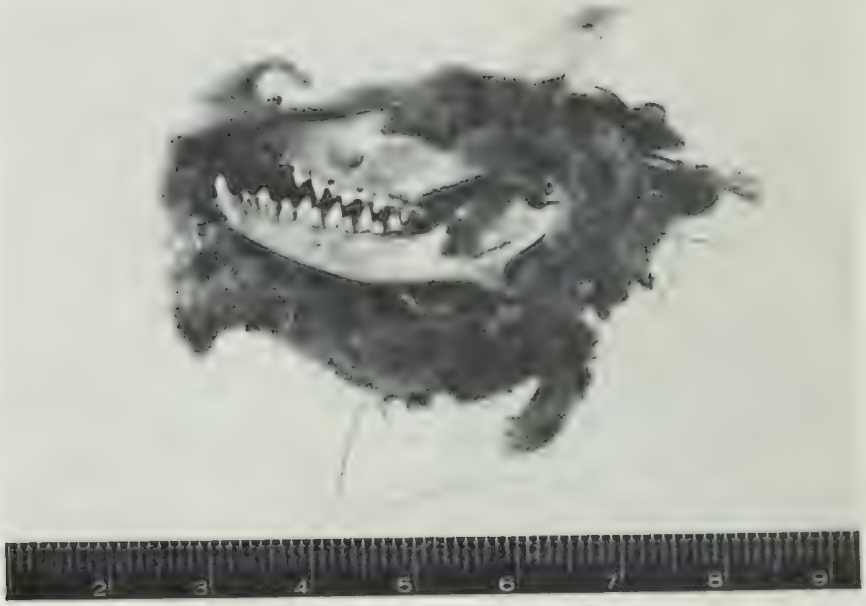

Fig. 1. A powerful owl pellet, intact, showing cranial remains of an adult tuan. Photograph by A. Easton, Queensland Museum.

Fig. 2. Adult male tuan trapped recently in the study area on Mt. Alexander, central Victoria. Photograph by D. Gibbons.

collected on four occasions during 1979; 7 June, 26 July, 15 August and 30 September. Identifications were made from both cranial and postcranial skeletal material and in some cases from hairs. All intact pellets were dried, weighed (average individual whole weight, 6 g) and examined separately. Disintegrated pellets were weighed to provide an estimate of the numbers of pellets originally present. Material collected 7 June represented approximately 23 pellets (dry weight 140 g), that collected 26 July approximately 50 pellets (305 g, 35 intact), that collected 15 August approximately 40 pellets (240 g, 24 intact) and that collected 30 September approximately 60 pellets (360 g, 20 intact).

Maximum numbers of prey species were best indicated by dentary and maxillary counts for mammals and humerus counts for birds. Table 1 shows that heaviest predation on tuans occured in the May-June period while insignificant numbers were taken in July, August and

September. Predation on sugar gliders continued throughout the study period with greatest numbers taken during July. Heavy predation on brush-tail possums *Trichosurus vulpecula* occurred in September. All brush-tail remains in pellets were those of juveniles whose permanent premolars had not erupted. During July and August, when mammal prey diversity was at its lowest, heavy predation on magpies occurred. Fig. 1 shows a powerful owl pellet, intact, containing cranial remains of an adult tuan.

Discussion

Results shown here point to the obvious absence of ringtails in the owl's diet. Although Menkhorst and Gilmore (1979) indicate that ringtails are 'uncommon and widespread' in central Victoria, and although the Forests Commission, Victoria records ringtails as occurring on Mt. Alexander, their complete absence in owl pellets supports the observation of the Bendigo Mammal Survey Group that although ringtails occur in central Victoria, they do not occur in the study area.

In the absence of ringtails and greater gliders the Mt Alexander powerful owls take sugar gliders as their primary winter mammal prey item, with heaviest predation occuring in July. These gliders are also considered 'uncommon and widespread' in central Victoria (Menkhorst and Gilmore 1979). In a study of the feeding ecology of powerful owls, Tilley (1979) found that at Coranderrk (Healesville, Vic) and Gormandale, Vic, sugar gliders formed a significant part of the owls' diet (second to ringtails) and that while these gliders were present at a third locality, Pt. Addis, Vic, they were replaced as secondary food items by the Australian magpie *Gymnorhina tibicen*, the Australian raven *Corvus coronoides* and the grey currawong *Strepera versicolor*. Tilley also noted that, at Healesville, the sugar gliders were primarily preyed on in autumn and the ringtails in winter.

Although the sugar gliders at Mt Alexander appear in each month's pellets, lowest numbers were taken in August, at which time highest predation on magpies was recorded. Whether this change reflects on a low mammal (and particularly a low glider) availability, a more accessible magpie pool or a change in preferences associated with the owls' possible nesting activities at that time it is not known.

The dramatic appearance of young brush-tails in the diet during September and the concurrent disappearance of magpies reflects the owls' preference for large but manageable mammalian prey. During this month, owls capitalized on the emergence of autumn-born brush-tail joeys, which travel on their mothers' backs for about two months after emergence from the pouch (Tyndale-Biscoe 1973). It is possible that during these months the young possums are attacked and snatched by the owls while riding on their mothers' backs. The heavy predation indicates a significant factor involved in the extremely high mortality rate which operates on juvenile brush-tails (Tyndale-Biscoe 1973).

The heavy predation on tuans is unique. Although tuans are regarded as 'uncommon to rare in the south, not recorded in the north' of central Victoria (Menkhorst and Gilmore 1979), it appears that at Mt Alexander relatively high densities occur. This is supported by the results of a trapping survey conducted on Mt Alexander by the Bendigo Mammal Survey Group during 1979. From a total of seven sites on the mountain, three individual males and two individual female tuans were collected during the period 24 February-2 March, while during the period 8-12 May four individual males and four individual females were trapped, marked and released. Of these six were trapped at heights exceeding 5 m from the ground. One of these individuals, an adult male caught 11 May 1979 is shown in Fig 2.

Fig. 3. Adult tuan *Phascogale tapoatafa*, a newly recorded addition to the diet of powerful owls *Ninox strenua*. Photograph by Stan Breeden, Queensland Museum.

Other mammals trapped in the area included the house mouse *Mus musculus*, black rat *Rattus rattus*, and the yellow-footed antechinus *Antechinus flavipes*. Although the same sites were trapped on every night between August 11-25 only one female tuan was caught (24 August). This female had seven hairless pouch young indicating their birth in early July. A number of other observations suggest a mid-winter parturition for Victorian tuans. In 1934 Fleay recorded the early July births of three young to a captive female tuan. A female, lactating from eight nipples was trapped at Mt. Alexander on 25 November 1976 (Menkhorst and Gilmore 1979).

In the light of mid-winter births of tuans in Victoria, the poor trapping results during August, and the abrupt decline in tuan predation by powerful owls after June it is very tempting to view these events in light of the well documented stereotyped antechinus reproductive pattern — the most relevant features of which include a population peak around autumn, a frantic mid-year period of mate-seeking and wandering by males, followed by a male 'die-off' and female nest-attachment and trap-shyness. The substance of these predictions will, no doubt, be elucidated by the results of the current trapping program being undertaken by the Bendigo Mammal Survey Group.

Acknowledgements

The field assistance of Mr. R. Speechley and Mr. J. Robinson is gratefully acknowledged and our thanks are due to the Bendigo Mammal Survey Group for access to their records and the Victorian Fisheries and Wildlife Division for their co-operation with permits. We wish to thank Mr John Seebeck of the Arthur Rylah Institute for Environmental Research, Victoria and Ms. Jeanette Covacevich of the Queensland Museum for reading and criticizing this work.

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The Effects of Introduced Animals and Plants in Australia

The FNCV in conjunction with the Department of Environmental Studies at Rusden State College, are planning to hold a Symposium on "The Effects of Introduced Animals and Plants in Australia" on Sunday, 27 July, 1980. The symposium arose orginally from an idea of having a special issue of the **Victorian Naturalist** based on this theme; but in view of the public interest in this area and also that 1980 is the FNCV's Centenary Year, it is now planned to hold a Symposium in which invited speakers will present papers on different aspects of exotic flora and fauna in Australia. It is hoped that the following will be covered during the Symposium: dogs, cats, birds, pigs, carp, trout, molluscs, weeds, boneseed, blackberry and aquatic plants.

The venue is to be lecture theatre AB 100, Rusden State College, 662 Blackburn Rd, Clayton. We anticipate that the Symposium will commence at 9.00 a.m. and be concluded by 4.30 p.m., and that pre-registration of people wishing to attend will be necessary (to facilitate printing of abstracts, catering etc.).

It is hoped that each paper will be published in booklet form during September, as well as be printed in Volume 98 of the **Victorian Naturalist**.

Further details regarding speakers and their subjects and on registration will appear in the next issue of the **Victorian Naturalist**.

Mesoplodon bowdoini Andrews (Ziphiidae): a New Whale Record from New South Wales

By C. R. Tidemann*

Abstract

Two female specimens of Andrew's Beaked Whale, *Mesoplodon bowdoini*, were stranded on the NSW Coast, south of Bermagui, in August, 1974. These appear to be the fifth and sixth records of this species stranded in Australian waters and considerably extend its known distribution.

Introduction

Andrew's Beaked Whale, *Mesoplodon bowdoini*, has been known previously in Australia from only four specimens. The first of these stranded at Bunbury, Western Australia in 1944, (Glauert, 1947), the second and third in Tasmania, at Stanley in 1947 and Marion Bay in 1967, (R. M. Warneke, personal communication; Guiler, 1967) and the last at Hordern Vale Beach, in Victoria, in 1968 (Dixon, 1970) (Fig. 1).

Only six animals are known to have come ashore in New Zealand (Gaskin, 1968). *M. bowdoini*, thus appears to be either a rare animal, or an uncommon strander, in Australia and New Zealand.

Stranded animals

Both whales reported here came ashore at about the same time, August 23, 1974. The first washed up at Bunga Beach, 16 km south of Bermagui and the other 7 km south of Bermagui at Barragga Bay (Fig. 1). They were in an advanced state of decomposition when I recovered them in October 1974. The first animal was still lying on the beach and it was possible to partially flense it. The second had been buried below the high tide mark by local residents and flensing was not feasible.

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The skeletons of both animals were macerated and are now stored in the Zoology Department collection, registered numbers 2180 and 2181. Except for some damage to the ribs, the smaller skeleton (2180) is virtually entire and has been articulated. Extensive damage had been done to the skull, vertebrae and ribs of the other, presumably by wave action on rocks, and it has been stored disarticulated.

2180 is a subadult female, as judged by the unfilled pulp cavities in the teeth and unfused vertebral epiphyses. The total length from the tip of the beak to the caudal fork was 329 cm. 2181, also a female, is larger and adult, with completely ankylosed vertebral epiphyses and the pulp cavities of the teeth filled; total length 457 cm.

Both animals were identified as *Mesoplodon bowdoini* by reference to McCann (1962), Moore (1963) and Moore (1968).

Acknowledgements

I should like to record thanks to Mr J. B. Russack of Dignam's Creek, NSW for reporting to me the locations of the stranded whales and for stoically enduring the unpleasant smell during the recoveries; and Wendy Lees for drawing the figure.

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Figure 1. Records of stranded *Mesoplodon bowdoini* in Australia and New Zealand. Animals reported in this paper and other occurrences.

A Check List of the Victorian Pyrenomycetes and Loculoascomycetes

What are Pyrenomycetes and Loculoascomycetes? Like the Discomycetes, they are fungi which belong to the Ascomycetes, that is, fungi which typically produce 8 spores within a sac-like sporangium or ascus. Pyrenomycetes are very numerous and the asci are contained in flask-shaped or round fruiting bodies. Many of the small black fungi common on dead branches belong to this group. The asci are club-shaped or round, do not open by a hinged lid or operculum, and have a single wall (unitunicate). They are produced in bundles at the base of the flask-shaped fruiting body or in a layer lining the inside of a closed, spherical fruiting body.

Fungi belonging to the other group included in this check list, the Loculoascomycetes, also produce their spores within a sac-like ascus, but the ascus has two distinct, separable walls. These can often be seen with a microscope because the outer wall, which is thick and inextensible ruptures near the apex and the thin inner wall expands into a long cylindrical sac with an apical pore through which the ascospores are discharged in succession. The asci are embedded in cavities in a mass (stroma) of fungal tissue.

The following Check list of Victorian Pyrenomycetes and Loculoascomycetes is compiled mainly from collections made in Victoria since 1963. Except in a few cases where the collection was too small for division, part of each collection was sent either to Kew Herbarium or the Commonwealth

Mycological Institute, England. In these two Institutions all local determinations were either confirmed or corrected and unnamed collections identified where possible.

Experience would seem to indicate that this list contains most of the larger Victorian species, as collecting during the last few years has yielded little not previously recorded. No doubt there are still numbers of the smaller and inconspicuous species that have not been collected but here again, perhaps due to changing forest distribution and climatic conditions, the last few years have yielded very few species not previously gathered. An increase in the number of collectors would help greatly but because of the inconspicuous appearance of the Pyrenomycetes and their allies, even those who are interested in the fungi tend to overlook them.

With this Check List we have followed the same course as with the Discomycete check list and, with one exception, have ignored all previously published lists. This is because of the difficulty in identifying with certainty the species and genera contained in these lists. The exception is the list of *Cordyceps* species with key published by Dr J. H. Willis in Muelleria, Vol. 1, No. 2, 1959. Here we have listed all species recorded for Victoria, keeping separate those species we have not collected or examined; these are species of which further collections are urgently needed.

The taxonomic systems used are, for the Pyrenomycetes, that of E. Muller and J. A. von Arx and for the Loculoascomycetes, E. S. Lutterell, both from *The Fungi*, Vol. IV A, edited by Ainsworth, Sparrow and Sussman and published by Academic Press, 1973.

The following is a short list of references useful in the determination of the Pyrenomycetes and their allies:

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The list records 117 species of 58 genera from 19 families of Pyrenomycetes and Loculoascomycetes collected in Victoria.

ASCOMYCOTINA
PYRENOMYCETES

Meliolales
- Meliolaceae
  - *Asteridiella coprosmae* Hansf.
  - *Meliola baileyi* Hansf.
  - *M. lanosa* Pat. var. *funerea* (McAlp.) Hansf.
  - *M.* sp.

Coronophorales
- Coronophoraceae
  - *Calyculosphaeria collapsa* (Romell) Fitzp.
  - *Fracchiaea heterogena* Sacc.
  - *Nitschkia floridana* Fitzp.
  - *Thaxteria leptosporoides* (Wint.) Fitzp.

Sphaeriales
- Melanosporaceae
  - *Microthecium beatonii* Hawksw.
  - *M. perplexum* Hawksw.
  - *Phaeostoma lagenarium* (Pers. ex Fr.) Munk
- Verrucariaceae
  - *Pharcidia epicymatia* (Wallr.) Wint.
- Sordariaceae
  - *Bombardia facsiculata* Fr.
  - *Lasiosphaeria hirsuta* (Fr.) Ces. & de Not.
  - *L. ovina* (Fr.) Ces. & de Not.
  - *L. spermoides* (Hollm. ex Fr.) Ces. & de Not.
  - *L.* sp.
  - *Pleurage* Fr. sp.
  - *Sordaria anserina* (Ces.) Wint.
  - *S. bombardioides* Auersw.
- Polystigmataceae
  - ? *Glomerella* Spauld. & Schrenk sp.
- Hypocreaceae
  - *Creopus* Link - *Chromocrea* Seaver
  - *C. gelatinosus* (Tode ex Fr.) Link
  - *C.* sp.
  - *Gibberella cyanogena* (Desm.) Sacc.
  - *Hypocrea citrina* (Pers. ex Fr.) Fr.
  - *H. macrospora* Dingley
  - *H. sulphurea* Schw.
  - *H.* sp.
  - *Nectria haematococca* Berk. & Br.
  - *N.* cf. *inventa* Pethybridge
  - *Nectria mammoidea* Phill. & Plowr.
  - *N. ochroleuca* (Schw.) Berk.
  - *N.* sp.
  - *Protocrea farinosa* (Berk. & Br.) Petch
- Sphaeriaceae
  - *Anthostoma* Nitschke sp.
  - *Calosphaeria* Tul. sp.
  - *Chaetosphaeria callimorpha* (Mont.) Sacc.
  - *C.* sp.

Niesslia exosporioides (Desm.) Wint.
Rhynchomeliola Speg. sp.
R. sp.
Diaporthaceae
Ceratosphaeria crinigra (Cke.) Sacc.
Endoxyla Fuckel sp.
Clavicipitaceae
Barya agaricicola (Berk.) Hohnel
Claviceps purpurea (Fr. ex Fr.) Tul.
Cordyceps cranstounii Olliff
C. gunnii (Berk.) Berk.
C. hawkesii (Gray) Cke.
C. militaris (Fr.) Link
C. robertsii (Hook.) Berk.
C. scottiana Berk. ex Olliff
C. taylori (Berk.) Sacc.
C. zebrina Willis & Beaton (unpublished).
Cordyceps species in Willis (1959) not collected or seen.
C. aphodii J. Mathieson
C. ?bicephala Berk.
C. brittlebankii McLennan & Cookson
C. coxii Olliff
C. furcata McLennan & Cookson
C. meneristitis F. Muell. & Berk.
Diatrypaceae
Diatrype stigma (Hoffm. ex Fr.) Fr.
Eutypella russodes (Berk. & Br.) Berl.
Peroneutypa heteracantha (Sacc.) Berl.
Xylariaceae
Anthostomella chionostoma (Dur. & Mont.) Sacc.
A. wyalongensis Petr.
A. sp.
Daldinia concentrica (Bull. ex Fr.) Ces. & de Not.
Hypoxylina Starb. sp.
Hypoxylon archeri Berk.
H. bovei Speg.
H. bovei Speg. var. *microspora* Miller
H. confluens (Tode ex Fr.) West.
H. cf. *diatrypeoides* Rehm
H. hians (Berk.) Cke.
H. howieanum Peck
H. investiens (Schw.) Curt.
H. nummularium Bull. ex Fr.
H. rubiginosum (Pers. ex Fr.) Fr.
H. serpens (Pers. ex Fr.) Kickx
H. serpens (Pers. ex Fr.) Kickx var. *macrospora* Miller
H. uniapiculatum (Penz. & Sacc.) Miller
H. vogesiacum Pers. var. *microspora* Miller
Penzigia cf. *cantarirense* P. Henn.
Poronia punctata (L. ex Fr.) Fr.
Rosellinia inspersa (Berl.) Sacc.
R. cf. *nitens* Ces.
R. thelena (Fr.) Rab.
R. sp.
Sarcostromella spathulata (Berk. & Br.) Boed.
Xylaria anisopleura (Mont.) Fr.
X. apiculata Cke.
X. feejeensis Berk. var ?*faveolis* (Lloyd) Dennis
X. mellisii Berk.
X. multiplex Sacc.
X. readeri Muller
X. zealandica Cke.
X. sp.
Amphisphaeriaceae
Lejosphaerella Hohn. sp.

LOCULOASCOMYCETES

Dothideales
Capnodiaceae
Capnodium salicinum Mont.
Dothideaceae
Mycosphaerella lineolata (Rob. & Desm.) Schroet.
Pleosporales
Botryosphaeriaceae
Botryosphaeria dothidea (Moug. ex Fr.) Ces. & de Not.
Sporormiaceae
Delitschia bisporula Phill. & Plowr.
D. winteri Phill. & Plowr.
Sporormia megalospora Auers.
Pleosporaceae
Asteromassaria macrospora (Desm.) Hohnel
Didymosphaeria Fuckel sp.
Leptosphaeria juncicola Rehm
L. parvula Niessl
L. plagia (Cke. & Mass.) Hohn.
L. sp.
Ophiochaeta (Sacc.) Sacc. sp.
Pleospora herbarum (Fr.) Rab.
Trematosphaeria Fuckel sp.
Hysteriales
Hysteriaceae
Gloniella normandina Rehm
Glonium stellatum Muhl.
Hysterium angustatum (Schw. & Alb. ex Fr.) Chev.
H. cf. *berengerii* Sacc.
Hysterographium mori (Schw.) Rehm
Mytilidion Duby sp.

G. Beaton, Eildon, Victoria.
G. Weste, Botany School, University of Melbourne.

Pre-impoundment Distribution of Fishes in the Lerderderg River, Victoria

By J. P. Beumer* and D. J. Harrington*

Introduction

If the movement of fishes in the form of upstream or downstream migrations is restricted, the success of the fish community, particularly its longitudinal distribution, abundance, individual growth and spawning success may be impaired (Meek 1916; Heape 1931; Hall 1972). Consequently when the Victorian State Rivers and Water Supply Commission proposed the construction of a small diversion weir on the Lerderderg River the Fisheries and Wildlife Division conducted a number of pre-impoundment surveys of the fish distribution of this river. The Division requested that a fish-ladder be incorporated in the weir to permit both upstream and downstream movement of aquatic organisms, particularly fishes. The results of those surveys are reported here and the effects of the weir's construction are considered.

Study Area

The Lerderderg River, fed by springs, flows southwards from the Great Dividing Range and forms part of the Werribee River coastal drainage (Fig. 1). The catchment area, about 50 km north-west of Melbourne, falls within a forestry reserve, the habitat of which has been altered little except by gold-prospecting. The diversion weir, about 8 km upstream of the southern end of the Lerderderg Gorge is designed to divert water through a series of tunnels to the nearby Merrimu Reservoir.

Fish-ladder

The fish-ladder is a pool-type fishway (Sakowicz and Zarnecki 1962) with full weirs and submerged orifices (Fig. 2). The upstream inlet is below the minimum water level in the storage to ensure that the fish-ladder will always be operative. A compensation flow is to be maintained downstream of the weir to provide habitat for aquatic organisms as well as irrigation water for riparian market gardens.

Method

The Lerderderg River was sampled at irregular intervals from March 1976 to May 1979. Sampling sites (Fig. 1) were selected for accessibility and the location of the weir. O'Briens Crossing was sampled on 6 occasions, the Weir and Lower Gorge on five, and Blackwood on one. At O'Briens Crossing, Weir, and Lower Gorge, four methods of sampling were made: electrofishing (with a 240 v d.c. unit, fishing 100 m of

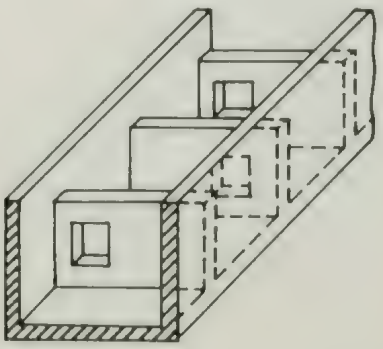

Fig. 2. Lateral view of fishladder steps, showing full weirs and orifices.

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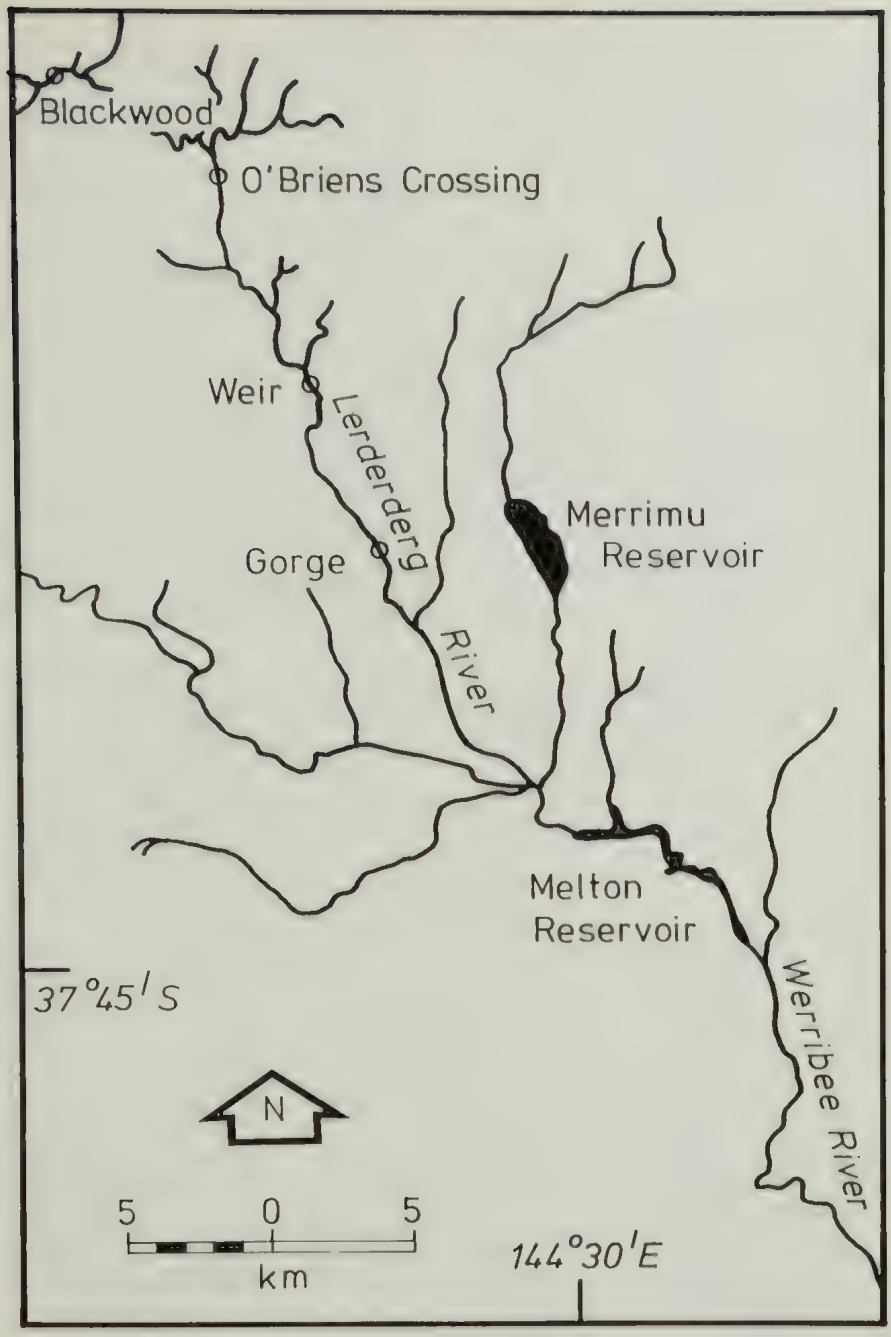

Fig. 1. Sampling sites in the Lerderderg River and Melton Reservoir.

stream); fyke nets (mesh-size 20 mm); mesh nets (mesh-size 65 and 90 mm) and direct observations. The fyke nets and mesh nets were used in pools where the depth of water limited the efficiency of the electrofishing unit. At Blackwood, only electrofishing was used.

In addition, Melton Reservoir, situated on the Werribee River, was sampled once (February 1979) with a series of mesh nets (from 25 to 152 mm, in 12.7 mm gradations) and fyke nets (20 mm).

Each fish captured in the Lerderderg River was identified, measured (total length) and weighed. Those captured in the Melton Reservoir were identified and fish at the limits of the length and weight ranges were measured. Specimens not required for laboratory analyses were released.

Results

Distribution of 10 species of fish taken during the survey are present in Table 1. Four species were recorded only from the Lerderderg River System: river blackfish *Gadopsis marmoratus* Richardson, 1848, common galaxiid, *Galaxias maculatus* (Jenyns, 1842), Australian smelt, *Retropinna semoni* (Weber, 1895), and brown trout, *Salmo trutta* Linnaeus, 1758; two were common to both the Lerderderg River System and Melton Reservoir: short-finned eel, *Anguilla australis* Richardson, 1841 and roach, *Rutilus rutilus* (Linnaeus, 1758), and four further species were recorded only from Melton Reservoir: English perch, *Perca fluviatilis* Linnaeus, 1859, tench, *Tinca tinca* (Linnaeus, 1758), common carp, *Cyprinus carpio* Linnaeus, 1758, and

Table 1. Total length and weight ranges of fishes caught at four localities on the Lerderderg River, March 1976 — February 1979, and Melton Reservoir, February 1979. (FN, fyke net; MN, mesh net; EF, electrofishing; +, direct obervations)

Locality/ Date	Species	No	T.L. range (mm)	Wt. range (g)	Sampling method
Blackwood					
Mar. 76	Short-finned eel	1			+
	Brown trout	29	90-249	5-185	EF
O'Briens Crossing					
Mar. 76	Short-finned eel	2	594-690	400-640	EF
	River blackfish	4	132-288	25-185	
	Brown trout	27	107-304	15-250	
Jan. 77	Short-finned eel	2	415-570	110-280	FN
	River blackfish	5	213-272	30-100	
Jan. 78	Short-finned eel	7	313-672	40-520	EF
	River blackfish	3	78-223	10- 85	
	Brown trout	1	20	5	
Oct. 78	Short-finned eel	1	495	215	EF
	River blackfish	2	160-100	35- 70	
	Brown trout	3	132-148	25- 40	
	Crayfish	1	150		
Nov. 78	Crayfish	1			EF
Feb. 79	Short-finned eel	3	445-640	195-520	EF
	River blackfish	8	100-275	15-125	
	Brown trout	5	90-225	10-115	
	Crayfish	3	180-560		

Table 1. (Cont'd)

Locality/ Date	Species	No.	T.L. range (mm)	Wt. range (g)	Sampling method
Diversion Weir Site					
Mar. 76	Short-finned eel	9	216-514	20-265	EF
	River blackfish	14	73-287	5-185	
	Brown trout	10	106-230	15-115	
Jan. 77	Short-finned eel	5	465-727	160-710	FN
	River blackfish	4	164-280	20-210	
	Brown trout	8	215-335	80-310	FN,MN
Jan. 78	Short-finned eel	7	255-482	30-210	EF
	River blackfish	10	98-236	10-100	
	Brown trout	8	80-285	5-215	
Feb. 79	Short-finned eel	1	940	940	EF
	River blackfish	6	200-305	60-195	
	Brown trout	5	111-275	20-215	
May 79	Short-finned eel	1			+
	Common galaxiid	1			
	Brown trout	3	120-155	15- 35	EF
Lower Gorge					
Apr. 76	River blackfish	17	49-251	10-120	EF
	Australian smelt	1	41		
	Brown trout	3	103-244	10-145	
	Roach	15	142-165	25- 45	
July 78	River blackfish	1	185	65	EF
Nov. 78	Short-finned eel	2	470-690	195-660	EF
	River blackfish	2	167-224	35- 81	
Nov. 78	Brown trout	2	209-210	102-111	EF
	Crayfish	1		19	
Feb. 79	River blackfish	8	100-250	10-120	EF
	Brown trout	1	270	190	
May 79	River blackfish	2	165-200	40- 60	EF
	Common galaxiid	1			—
	Brown trout	3	260-370	170-550	EF
Melton Reservoir					
Feb. 79	Short-finned eel	2	603-663	400-570	FN
	Roach	106	189-284	65-275	FN,MN
	English perch	69	155-395	35-1095	FN,MN
	Tench	2	216-364	140-760	MN
	Common carp	27	126-628	35-3700	FN,MN
	Goldfish	4	232-271	235-480	MN

goldfish, *Carassius auratus* (Linnaeus, 1758). Of all these species only four are native fishes, the short-finned eel, river blackfish, common galaxiid, and Australian smelt, with the remainder being exotic fishes. In addition, freshwater crayfish (*Eustacus* sp.) and long-necked tortoise (*Chelodina longicollis* (Shaw)) were recorded from the Lerderderg River and Melton Reservoir respectively.

While the numbers of individuals varied between samples and between sites, three species of fishes, short-finned eel, river blackfish and brown trout, were distributed throughout the Lerderderg River System, whereas the remaining species occurred infrequently and at fewer sites.

Discussion

Construction of a weir and subsequent diversion of water will alter the distribution of the fishes by modification of the water-flow regime and physical division of the river. To some extent, the pre-impoundment fish distribution of a river system may be maintained by a suitable fish-ladder which permits upstream and downstream movement of fishes (Clay 1961). The species most affected by construction of the diversion weir on the Lerderderg River will be the native fishes, short-finned eel and river blackfish, and to a lesser degree, the exotic brown trout. Because eels are catadromous, juveniles of this species require unrestricted access to the headwaters and mature adults to the lower reaches of this river system. Although the biology of the river blackfish has not been fully documented, this species is sensitive to modification of habitat (Jackson 1978). Brown trout may often move long distances to locate suitable gravel in which to spawn or to utilise different feeding areas. The effect on brown trout below the Weir will be less as annual restocking of the Werribee River with brown trout allows for recolonisation of the lower reaches of the Lerderberg River by this species. Any increased siltation below the Weir, either as a result of the weir's construction or an inadequate compensation flow may affect the spawning of both river blackfish and brown trout as the eggs of both species are demersal. Excessive siltation may also result in changes in the composition of benthic invertebrate and subsequently the food available to fishes. The impoundment created upstream by the Weir may also provide habitat for species other than those presently occurring in the Lerderderg River, the majority of which are exotic species, e.g. English perch, carp, tench, which prefer the more stable habitat afforded by such impoundments.

Acknowledgments

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Additional Records of Plants from the Mallee

By P.D.C. Cheal*

Introduction

The overall aim of Beauglehole (1979) in his report "The Distribution and Conservation of Native Vascular Plants in the Victorian Mallee" is ". . . to present the most reliable and detailed account possible . . ." (p.1), for use by the relevant land managers and others interested in land use. As MacFarlane states in the 'Forward' (sic) to that publication "It (the report) represents a remarkable individual attempt to document . . . the present distribution and status of plant species over the great area of the Victorian Mallee." Nevertheless, additions, deletions and further qualifications to the report can be expected as the region becomes better known. Much of Beauglehole's field survey work had to be done during summer, some even in drought years, and consequently many species, particularly annuals which are such a feature of the region's flora, would have been missed. After all, the region does comprise 43000 sq. km. — 19% of the state.

From February 1978 to February 1979 a team consisting of three research officers (J. C. Day and P.D.C. Cheal and C. W. Meredith) investigated the effects of fire in the Mallee, with funds provided to the National Parks Service (Victoria) from the Australian National Parks and Wildlife Service. An interim report has been prepared and a final report will be published soon. The main study areas investigated were Hattah Lakes National Park, Wyperfeld National Park, central-west Sunset Country and Little Desert National Park (outside the Mallee region). A large part of the study consisted of a floristics-based vegetation analysis and, as a consequence, much information was collected on the distributions and abundances of many plants. Where this information adds new records or clarifies distributions discussed by Beauglehole (1979) it is presented below. Major and minor grids are given and grid references are taken from the relevant 1:250 000 mapsheet (Mildura or Ouyen). Further records from sites already recorded for the species are not presented (e.g. *Acacia myrtifolia* at Red Bluff, *Acacia trineura* from Lake Brambruk). All specimens retained for National Parks Service, Head Office plant collection are annotated 'NPS'.

Nomenclature follows Willis (1970 & 1972), except for *Gonocarpus tetragynus* which is the preferred name for the plant Willis (1972) refers to as *Haloragis tetragyna* (see Orchard, 1975).

Additional Records to Appendix 5 of Beauglehole (1979) — 'Rare - Interesting - Restricted Species'

Acacia lineata B43,503588, roadside between Nypo and Yaapeet. Collected by A. Hall, ranger, Wyperfeld N.P., October 1979.

Acacia lineolata B24,497618, Wyperfeld N.P. (NPS) 5 mature individuals, (no regeneration) in riverain woodland, collected 26/11/1978, ident. M. A. Todd (Nat. Herb. Vict.).

Centrolepis cephaloformis B34,505615, Wyperfeld N.P. — Freeway track (NPS). However, as Willis (1970, p.278) states this plant has been ". . . doubtless overlooked because of its diminutive size and moss-like appearance." The species is abundant in Wyperfeld (B24, B33, B35, B42)

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and was also found at Hattah Lakes N.P. (A44, high dune immediately north of Lendrook Plain) and the Sunset Country site (A38, deep sandy dune at grid ref. 432712).

Ceratogyne obionoides A39, 435713 Sunset Country — central west (NPS).

Cheilanthes tenuifolia B34, 501603, Wyperfeld N.P. — 300 m north from Barry's Track (NPS).

Choretrum spicatum B42, 492590, Wyperfeld N.P. — Albacutya extension, in area burnt by December, 1977 fire.

Comesperma calymega B33, 494604, Wyperfeld N.P. — Big Desert (NPS) but widespread and common throughout the sand heaths of the western side of Wyperfeld (B23, B24, B33, B34, B42).

Danthonia pilosa The tufted *Danthonia* sp. widespread but uncommon throughout the western sand heaths of Wyperfeld N.P. (B23, B24, B32, B33, B34, B42) agreed with the description of this species very well (rings of hairs on the lemma reduced to single marginal tufts). However on one plant collected at Little Desert National Park the lemmas, *within the one spike* had rings of hairs varying from reduced to marginal tufts to a complete ring.

Drosera glanduligera B35, 524604 and 522606, Wyperfeld N.P. — Frog Lagoon and Dattuck Reference Area, respectively.

Eucalyptus polybractea B5, 470677, Pink Lakes State Park — on dunes immediately south of Saltbush Flat app. 1.5 km NNW of Lake Becking (NPS).

Gonocarpus tetragynus (syn. *Haloragis tetragyna).* Widespread throughout the sand heaths of Wyperfeld N.P. (B23, B24, B32, B33, B42).

Helipterum laeve B32, 481605, Wyperfeld N.P. — Rudd's Rocks (NPS), also seen at B35, 606516, Wyperfeld N.P. — North-south Track and A39, 435713, Sunset Country — central west.

Hydrocotyle rugulosa B32, 482615, Wyperfeld N.P. — Big Desert (NPS), but common throughout under dense *Melaleuca uncinata* (B23, B33, B35) and also from A39, 441713, Sunset Country — central west.

Laxmannia sessiliflora B32, 418603, Wyperfeld N.P. — Big Desert (NPS), but widespread throughout the sand heaths of Wyperfeld (B33, B34, B42).

Levenhookia dubia B32, 481605, Wyperfeld N.P. — Rudd's Rocks (NPS), but also B35, 521607, Wyperfeld — Dattuck Reference Area and B34, 514608, Wyperfeld — North-south Track.

Microtis unifolia B34, 591603, Wyperfeld N.P. — beside entrance road (NPS), small colonies (app. 20) under *Eucalyptus largiflorens.*

Olearia floribunda B34, 515604, Wyperfeld N.P. — Dattuck Track (NPS); B35, 517613, Wyperfeld N.P. — Lunar clearing (NPS), but also A40, 456712, Sunset Country — central west.

Olearia lanuginosa B6, 485674, Pink Lakes S.P. — Southern boundary (NPS); B42, 492587, Wyperfeld N.P. — Albacutya extension (NPS).

Orthoceras strictum B33, 485615, Wyperfeld N.P. — Big Desert (NPS), scattered in sand heath.

Pimelea dichotoma B32, 483618, Wyperfeld N.P. — Big Desert (NPS).

Senecio magnificus A39, 435713, Sunset Country — central west (NPS), only on deep sand in reccently-burnt mallee.

Thysanotus tuberosus Undoubtedly most earlier records of this species refer to *Thysanotus baueri* which is common throughout the region. *T. tuberosus* was not seen.

Trachymene anisocarpa A39, 435713, Sunset Country — central west (NPS), only in recently burnt mallee and mallee-broombrush.

Velleia arguta A39, 438714, Sunset Country — central west (NPS).

Appendix 8 of Beauglehole (1979) — 'Deletions from the Vascular Flora of Mallee Study Area':

None of the species listed in Appendix 8, with one exception, were seen in the LCC Mallee Study Area. Many of the records (e.g. *Cryptandra amara, Dillwynia glaberrima, Drosera auriculata, Hakea rugosa, Opercularia varia* and *Teucrium corymbosum*) are doubtless misidentifications. The exception is *Lyperanthus nigricans* collected from Wyperfeld N.P. — Albacutya extension (at B42; Grid ref. 1:250 000 Series, Ouyen mapsheet, 492586) in sand heath burnt in the December, 1977 fire.

Discussion

The relatively large number of additional records presented above emphasises the lack of attention that the flora and vegetation of the Mallee region have traditionally received. For instance, the LCC Mallee Study Area report is the only LCC report that does not include a vegetation map. "The Distribution and Conversation of Native Vascular Plants in the Victorian Mallee" is an invaluable document, summarising much distributional data and highlighting significant occurrences (rare species, disjunct records etc). Were it not for this document, then the significance of the above records would not have been fully appreciated.

It is interesting to note that many species known from only a few records were found to be locally common, particularly in recently-burnt vegetation. Such species include *Calotis cymbacantha, Helipterum tietkensii, Nicotiana goodspeedii, Podolepis rugata, Senecio magnificus* and *Trachymene anisocarpa*, all herbaceous and predominantly annuals, but also many shrubs, such as *Acacia acanthoclada, Acacia wilhelmiana* and *Eremophila crassifolia*. These species and many others may be absent from 'mature' vegetation (except as seeds) but soon respond to the temporary lack of competition from the dominants post-fire and reappear in abundance. Before the true rarity of plant species can be appropriately assessed their responses to fire need to be known. Lack of records for *Acacia lineolata*, for example, indicates true rarity; lack of records for *Acacia acanthoclada* may indicate merely an inappropriate fire regime (seeds are apparently common in the soil, the species is locally abundant post-fire).

Acknowledgements

Thanks are due to Ms A. Morton for criticism of the manuscript. The data were collected as part of a study funded through the National Parks Service (Victoria) by the Australian National Parks & Wildlife Service.

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Omission

The caption to Fig. 1 of the article "Observation on rock climbing by the fish *Galaxias brevipinnis*" which appeared in Vol. 96 (6), page 130, should have had the following:
1 — dry rock; 2 — occasionally washed zone; 3 — permanent water flow.

Molluscs on Lake Mountain

The F.N.C.V. Excursion to Lake Mountain on December 2, 1979 proved of special interest for molluscan observations. The weather was cool to cold with thick cloud to ground level near the summit and a fine rain. Everywhere was soaking wet with the water running down the smooth bark of the Snow Gum, *Eucalyptus pauciflora alpina*. Large numbers of the native slug *Cystopelta petterdi* were seen crawling up the tree trunks with some observed actively crawling over 5m from the ground. There were approximately 5 to 10 slugs on each tree giving a possible number of slugs between the car park and the summit of many thousands all out actively crawling in the ideal conditions. Many of the animals observed were small juveniles (8-15mm long) while animals were observed up to 70-75mm long in a variety of shades from light greeny-buff to dark greeny-brown with large black blotches. Many had large drops of viscous mucus hanging from their caudal gland.

A specimen of the carnivorous snail *Rhytida* (?) *capillacea* was found by Norman Lu, one of the party. This was also about 1m off the ground crawling up the trunk of a tree. Extensive searching failed to reveal any other specimens of this species.

The carnivorous snail was placed in a plastic vial with a specimen of the slug found in the same area. Immediately the snail extended its head and everted the anterior part of its pharyngeal region. This was white in colour and extended about 2 or 3mm beyond the normal front of the head. The mouth was open and this was applied to the side of the slug. The slug reacted violently by turning on its side and curving its tail, withdrawing its head and secreting a milky white mucus from its body wall around the area of attack. This attack procedure was repeated by the snail a number of times to various parts of the slug over the next 5 minutes after which the slug was immobile in a contracted position at the bottom of the tube with a large amount of colourless and milky white mucus around it. The body wall of the slug was ruptured in two places and portions of the viscera were protruding from those ruptures. Two hours later the entire body of the slug except the foot had been eaten by the snail. This is the first record I have been able to find of a rhytidid eating a *Cystopelta*.

A *Sphagnum* bog was sampled with a dip net and a population of the small freshwater operculate *Glacidorbis hedleyi* was discovered. These small snails, 1-2mm diameter were found on the vegetation in cold slightly brown acid waters. This constitutes the seventh record of this species for Victoria and adds another valuable locality record to the emerging distribution picture of this minute species (Smith, 1978).

Two species of the family Charopidae were also taken on the excursion making it a very interesting day of mollusc collecting.

Smith, B.J., 1978. Notes on the molluscs of the Victorian Great Dividing Range. **Victorian Nat.**, 95(6): 236-40.

Brian J. Smith
Senior Curator (Zoology), N.M.V.

A Method of Reconstructing Furred Mammals both Living and Extinct

By M. Traynor* and K. Kelly*

It has long been a problem in natural history museums to construct life-like models of rare, endangered or extinct species of mammals for public exhibition because a method has to be found to reproduce a furred coat. In the past substitute skins such as calf or foal have been used but these are of limited use and often involve extensive alteration. There are a large number of mammals for which this substitution method

*National Museum of Victoria

would not be suitable because of complex colour patterns or variable hair length.

Experiments were therefore carried out on methods of artificially reproducing the structure and effect of fur on a model. The method described here is a flocking technique used in preparing a life-sized model of the Thylacine or Tasmanian Tiger/Wolf (*Thylacinus cynocephalus*) for display (Fig. 1).

Flocking Technique

Flocking is the application of false hair to a modelled body to represent as closely as possible the true coat of the animal being reconstructed. The flock is a vegetable fibre dyed and dried then finely chopped by a guillotine. The colour used depends, of course, on the animal being flocked, but no one pigment will achieve a natural looking colour texture. As many as five or six different colours may be needed to achieve the desirable finish and close study of the fur of the animal will reveal these colours. In the case of extinct or fossil animals a good imagination is helpful.

"Dylon" dyes have been successful for dying the fibre, but marketed colours are limited, so mixing is usually necessary. The dyed fibre is then chopped by guillotine to the length required which varies depending on:

a) Stage of flocking — short flock is used early because of a higher degree of adhesion.
b) Part of animal being flocked — short flock around nose etc.
c) Final applications — true length of hair used. The maximum length of flock that can be sprayed using the normally available techniques is about 12 to 14 mm.

Preparation of Body

With the body modelled and cast to the preparator's satisfaction, the eyes, mouth, lips and toenails are masked. The body is then sprayed with a coat of flat oil-based paint coloured as closely as possible to the colour of the animal being reconstructed. This gives a good base on which to work. A tongue can be made and inserted before or after flocking, but painting of all soft parts is done on completion.

Fig. 1. Completed model of a Thylacine or Tasmanian Tiger furred by the flocking technique.

Application of Flock

Two spray units are needed, one of which being a flock gun. The adhesive satin finish varnish is sprayed on to the body liberally but without allowing it to run. The hair tracts of the animal are considered carefully and the flock applied through the flock gun in the direction of the tracts. It is advisable to spray the animal in sections. The body can then be moved into different positions so that correct direction of flock is possible.

After initial flocking, the body is allowed to dry and is brushed through until all excess flock is removed and all remaining flock has correct direction. Only 20-30% of flock will adhere at first. Many applications will be needed to cover the body, allowing each application to dry and be brushed. As the flock forms a coat of hair, colour markings are considered. In the case of the Thylacine the stripes were applied by spraying only those areas with varnish, and then applying the darker flock.

Flocking is a very slow process. It cannot be rushed, as the varnish must be allowed to dry completely before brushing.

Finishing

Once a satisfactory coat is achieved, long hair areas, such as whiskers, and those around the feet can be added by hand. Soft parts are coloured and the animal is complete.

It should be stressed that the models prepared in this way will not stand close scientific scrutiny. The technique is geared towards public display interest to be viewed at a given distance.

Book Review

Lichens of South Australia

By Rex B. Filson and Roderick W. Rogers

(Handbook of the Flora and Fauna of South Australia series, Govt. Printer, Adelaide, 1 Nov. 1979. 21 x 14 cm, 197 pp., 16 colour plates, 28 full-page figures. Price $10.50)

South Australia is well ahead of the other States, in having such an excellent series of scientific contributions as its handbooks on flora and fauna which were initiated by the South Australian Branch of the British Science Guild in 1922. First came the *Flora of South Australia* (vascular plants, native and naturalized), Part I, by J. M. Black; it sold at a price of three shillings, and it is interesting to note that the third edition of this part — albeit much enlarged and with 16 colour plates — was published only last year for $16 retail! Black's *Flora* ran to four parts (1922-29); J. B. Cleland's *Toadstools and Mushrooms* etc. (1934-35) and A. H. S. Lucas's *Seaweeds* (1936 and 1947) were both in two parts. Excepting J. G. Wood's *Vegetation* (1937), no other botanical title has appeared in the series until now, and it is a great pleasure to welcome the trim volume under review.

This noteworthy book is the first attempt to give a systematic account of the lichen flora for an Australian State. Such a pioneering venture merits unstinted praise, as it forms a sound basis for further researches by that peculiarly dedicated breed of botanists brave enough to tackle the identification of lichens. In their introductory remarks the authors emphasize that the "study of lichens has lagged far behind the other fields of botany", an important reason for such neglect being "fear of a group that is notoriously difficult taxonomically". The dual organic composition of a lichen (i.e. fungal framework enclosing a layer of unicellular algae) poses a taxonomic problem, authorities having differed widely in their choice of criteria for the delimitation of species. Certainly one cannot progress very far without a powerful microscope, and chemical investigation

is often necessary to separate species of very similar appearance.

Filson and Rogers have successfully summarized what is known (and unknown) about the lichen species occurring in South Australia, most of which extend also to Victoria. After brief chapters on general structure, chemistry, collections from the time of Ferdinand Mueller's arrival in 1847 to the present day, lichen ecology, field collecting and herbarium techniques, and a modern classification into orders, families and genera, there are simple artificial keys to the South Australian coverage of families, those genera within families, and to genera direct. Then follows the descriptive text which is arranged alphabetically according to genera, a novel departure in the handbook series. Where a genus has two or more representatives, there is a key to species under the generic description. In addition to genera of known representation, all the ones that occur nearby in neighbouring States, and may be anticipated in South Australia, are also fully described.

Descriptions and lists of herbarium specimens (the authors having collected a large percentage) are given for a total of 195 species; 63 of these, or almost one third, belong to the large genus *Parmelia* in which Mr. Filson is particularly interested — he was involved in the naming of 17 species, and seven others are as yet without published names. All fruticose and foliose lichens are described, but in several large and still imperfectly investigated genera of crustose lichens (e.g. *Buellia*, *Caloplaca*, *Lecanora* and *Pertusaria*) no attempt has been made to sort out the South Australian entities, except for mentioning a few typical and widespread kinds.

Aided by the glossary on page 171, most botanists would be able to cope with the distinctive lichenial terminology used throughout keys and descriptions, and anyone interested in identification of their collectings should be helped by the photographic illustrations. Black-and-white figures are clear enough; but the colour plates leave much to be desired, being generally dull, fuzzy and featureless — a result of faulty reproduction that must be very disappointing to the original careful photographer. Filson's line drawings, so well known to readers of the *Victorian Naturalist*, are up to his usual high standard. A handy 15-page list of references and full index conclude this fine work which is printed on glossy paper; it will probably be the last new botanical monograph in the South Australian handbook series.

— J. H. Willis

"Kosciusko Alpine Flora"

by A. B. Costin, M. Gray, C. J. Totterdell, D. J. Wimbush
23 cm x 15 cm, 408pp including 170 colour pages. CSIRO/Collins 1979.
Board bound. Recommended retail price $25.00.

"Kosciusko Alpine Flora" is a book many people have been waiting for. As far as I know, nothing has been available about our high country since the 1970 publication on alpine plants by Thistle Harris which included montane and sub-alpine species as well as alpine ones, was directed to the layman, and did not attempt to be comprehensive. "Kosciusko Alpine Flora" is limited to alpine plants (i.e. those above the tree-line — approximately 1800 m (6000 ft)) in the Kosciusko National Park. It is organised for the professional botanist although the layman will find it equally useful, and is as comprehensive as present knowledge permits. But its interest is not limited to botanists.

The book opens with some brief information on the Kosciusko environment, basic geology, and white man's exploration, study and impact. Plant communities are discussed, supplemented by vegetation maps, tables, diagrams and photographs of habitats. Then follow botanical keys and descriptions of about 200 species of vascular plants; all but a few are illustrated in the next 126 colour pages. The descriptions are very adequate,

accompanied by useful notes on distribution elsewhere as well as at Kosciusko and on habitat. But synonyms are sadly missed.

The book ends with a lengthy bibliography, a lengthy glossary, and a complex but easily understood index.

The visual quality of "Kosciusko Alpine Flora" is as good as its scientific contents. It is printed on a firm, matt-surface paper with generous surrounding space, and the classic serifed type remains highly readable even in the smallest italics. The first part of the book includes 17 pages of black and white and 40 pages of colour photographs. They will delight every reader, whether or not he is interested in the geological and/or floral aspects they illustrate. There are one, two or three shots per page, some are superb, and the colour reproduction is remarkably good — a sufficient range of tones and none of the raw crude colour that we see in too many books about Australia. Thoughtful typography and generous space make the pages of botanical keys and descriptions as pleasant to look at as they are easy to use.

360 colour photographs of flower species with comments alongside are great aids to identification, especially for the layman. Common names are included but, although form and colour are evident in the pictures, there are no statements regarding size — and photos can be very misleading. Here is an extreme example. Photos of the largest and smallest alpine buttercups are on the same page, but the latter is shown larger than the former! The reader must turn to the index to locate the botanical descriptions where he finds that *Ranunculus anemoneus* is some six times larger than *R. millanii*. Such faults could be avoided if every photo carried a multiplication number alongside. Photo 176 x 1/3 and 177 x 4 would give the reader an idea of their actual size.

The authors of "Kosciusko Alpine Flora" have surely succeeded in their aim to produce a book of scientific merit combined with popular appeal. Although specific to Kosciusko, I surmise that it will be bought by everyone with an interest in any of our alpine areas. And the book is produced wholly in Australia. It is gratifying that the work of our Australian craftsmen (designer, type-setters, plate-makers, printer, etc.) can equal that of our Australian scientists, long renowned for their high standards.

"Kosciusko Alpine Flora" is now in the FNCV library. See it and you'll want to possess it!

MARGERY J. LESTER

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Report by Executive Council

The members of the Executive Council submit herewith Balance sheet as at 31 December 1979 and income and expenditure account for the year ended on that date, and report as follows:—

1. The Net Surplus of the Club for the year ended 31 December 1979 was $461 which, added to the Surplus brought forward at 1 January 1979 of $9,643, together with a transfer of $136 from Club Improvement Account, resulted in an Accumulated Surplus to be carried forward to next year of $10,240.
2. The members of the Executive Council took reasonable steps to ascertain, before the income and expenditure account and balance sheet were made out, that all known bad debts were written off and adequate provision was made for doubtful debts.
3. The members of the Executive Council took reasonable steps, before the income and expenditure account and balance sheet were made out, to ascertain that the current assets, other than debtors, were shown in the accounting records of the company at a value equal to or below the value that would be expected to be realised in the ordinary course of business.
4. At the date of this report, the members of the Executive Council are not aware of any circumstances which would render the values attributable to the current assets in the accounts misleading.
5. No charge on the assets has arisen, since the end of the financial year to the date of this report, to secure the liabilities of another person. No contingent liability has arisen since the end of the financial year to the date of this report.
6. No contingent or other liability has become enforceable or is likely to become enforceable within the period of twelve months after the end of the financial year which in the opinion of the members of the Executive Council will or may affect the ability of the Club to meet its obligations as and when they fall due.
7. At the date of this report the members of the Executive Council are not aware of any circumstances not otherwise dealt with in the report or accounts which would render any amount stated in the accounts misleading.
8. The results of the Club's operations during the financial year, in the opinion of the members of the Executive Council, were not affected by any item transaction or event of a material and unusual nature.
9. Since 31 December 1979, and to the date of this report, in the opinion of the members of the Executive Council, no item transaction or event of a material and unusual nature has occurred, which would affect substantially the results of the Club's operations for the next succeeding financial year.
10. No member of the Executive Council, since the end of the previous financial year, has received or become entitled to receive a benefit by reason of a contract made by the Club with the member or with a firm of which he is a member or with a company in which he has a substantial financial interest.
11. The principal activities and objects of the Club are to stimulate interest in natural history and to preserve and protect Australian Fauna and Flora. No significant change in the nature of those activities occurred during that period.
12. The names of the members of the Executive Council in office at the date of this report are as follows:

    Dr B. Smith
    Miss W. Clark
    Miss M. Allender
    Mr M. Howes
    Mr D. Krenus
    Miss L. Lumsden
    Mr J. Martindale
    Mr B. McGregor
    Mr A. Thies
    Mr M. Turner

This Report is made in accordance with a resolution of the Executive Council dated 25th day of March 1980.

Notes: 1. Auditors' Remuneration of $130 relates to auditing services only No other benefits were received by the Auditors in respect of their services to the Club.
2 No Emoluments were paid by the Club to any member of the Executive Council.
3 State Treasury Grants for 1976/77, 1977/78, 1978/79 and 1979/80 have been received, but grants totalling $5,500 had not been applied against expenditure at 31/12/1979.

FIELD NATURALISTS CLUB OF VICTORIA
BALANCE SHEET AT 31 DECEMBER, 1979

LIABILITIES

1978				1978
	Current Liabilities			
$1,646	Subscriptions paid in advance	$702		$3,678
2,126	Sundry Creditors	2,110		2,000
185	M. A. Ingram Trust Grant in hand	132		334
4,000	Treasury Grants in hand (Note 3)	5,500		
	Victorian Naturalist Subject Index Subs			29
1,195	paid in advance	—		267
				2,233
$9,152			$8,444	45
				807
	Special Funds & Accounts			
$5,033	Building Fund	5,486		$9,393
18,040	Publication Fund	27,479		
2,326	Excursion Fund	2,323		
500	Cententary Excursion Fund	2,000		
4,000	Marie Allender Excursion Fund	4,000		$6,812
100	Library Fund	100		-
4,778	Club Improvement Account	5,281		
5,217	Estate M. Wright Legacy	5,217		141
300	P. F. Morris Gift Account	300		—
200	Estate I. F. Knox Legacy	200		
1,466	Estate C. M. Walker Legacy	1,466		$6,953

ASSETS

1978				
	Current Assets			
$2,571	Cash at Bank	$2,571		
2,000	Commonwealth Bonds at cost	2,000		
261	Sundry Debtors	261		
	Stocks on Hand at cost—			
11	Badges	11		
154	Microscope Project	154		
2,351	Books for Sale	2,351		
	Flower Books			
1,911	Victorian Naturalist Subject Index	1,911		
$9,259				$9,259
	Fixed Assets at cost			
	Library Furniture and Equipment	$6,948		
	less written off	—	$6,948	
	Land—			
141	Cosstick Reserve, Maryborough	141		
—	Harold C. Frahm, Kinglake	—		
7,089				7,089

20	Estate R. S. Chisholm	20			**Investment of Funds at cost**		
610	Wilfred C. Woodcock Fund	644		$140	Australian Government Bonds	$ 00	
533	D. E. McInnes Fund	562		11,200	Australian Co-op Savings Bonds	[illegible]	
242	Microscope Project Account	282		500	MMBW Debentures	500	
5,787	Flower Book Account	—		6,100	Esanda Ltd Debentures	[illegible]	
90	N. A. Wakefield Memorial Fund	92			National Mutual Permanent Building		
252	V. H. & B. E. Miller Fund	276		10,000	Society — Deposits	10,000	
200	Estate Ivy Dixon	200		$27,900			22,900
520	Life Membership Fund	520					
812	Natural History Medallion Fund	882			**Building Fund**		
64	Kinglake Project Fund	64			Aust Gov't Savings Bonds		
250	Cedric Ralph Gift Account	250		$3,300	at cost	$3,300	
—	Estate I. Hanks	204		1,700	Esanda Ltd — Debentures at cost	2,100	
$51,350			57,852	33	Cash at Bank	86	
				$5,033			5,486
	Surplus Account						
$9,612	Balance at 1.1.79	9,643			**Publications Fund**		
156	Transfer from Club Improvement Fund	136			Aust Gov't Savings Bonds		
125	Surplus (Loss) for year	461		$13,600	at cost	$24,600	
$9,643			10,240		Book Stocks at cost—		
				2,802	Ferns of Victoria & Tasmania	2,055	
				49	Wildflowers Wilson Promontory	46	
				263	Birds of the Dandenongs	239	
				585	Sundry Debtors	416	
				791	Cash at Bank	123	
				$18,140			27,479
					Excursion Fund		
					Aust Gov't Savings Bonds		
				$1,000	at cost	$1,000	
				500	Aust Gov't — Centenary Excursion Fund	2,000	
				1,679	Cash at Bank	2,552	
				$3,179		$5,552	
				353	*Less* Sundry Creditors	1,229	
				2,826			4,323
$70,145			$76,536	$70,145			$76,536

FIELD NATURALISTS CLUB OF VICTORIA
GENERAL ACCOUNT
STATEMENT OF INCOME & EXPENDITURE
FOR YEAR ENDED 31 DECEMBER 1979

1978	Income			1978
	Subscriptions Received—			
$226	Arrears	$439		$9,596
9,162	Current	10,250		810
127	Supporting	94		1,316
				66
$9,515			$10,783	$11,788
$385	Sales of "Victorian Naturalist"		400	1,143
10	Advertising — "Victorian Naturalist"		—	2,000
	Interest Received—			$8,645
5	Library Fund	$5		
98	Bank Account	110		
190	Commonwealth Bonds	190		
494	Bonds — M. Wright Legacy	494		$168
95	Bonds — C. M. Walker Legacy	95		223
709	National Mutual Deposit	675		40
61	Life Membership Fund	70		58
85	Natural History Medallion Fund	94		
				185
$1,737		1,733		100
—	Profit — Victorian Naturalist Subject Index		542	557
15	Sundry Income		25	1,090
878	Profit on Book Sales		25	120
125	Loss for Year		—	
				448
				153
				$3,142
				$878
				—
			$14,122	$12,665
$12,665				

	Expenditure		
	Victorian Naturalist-		
	Printing	$9,980	
	Illustrating	584	
	Despatching	1,261	
	Editorial	—	
		$11,825	
	Less — Grants		
	Ingram Trust — 1979 Grant	1,716	
	Treasury (Note 3)	—	
			$10,109
	Working Expenses—		
	Postage & Telephone	362	
	Printing & Stationery	74	
	Rent of room for storage	40	
	General Expenses	173	
	Affiliation Fees, Subscriptions and Donations	164	
	Kinglake Expenses — Rates	120	
	Natural History Medallion Expenses	28	
	Typing & Clerical Assistance	1,036	
	Auditors' Remuneration (Note 1)	130	
	Rent of Hall, Library and Museum Room	628	
	Insurance	158	
			2,913
	Club Improvement Account—		
	Transfer of Profit on Book Sales		639
	Surplus for Year		461
			$14,122

FIELD NATURALISTS CLUB OF VICTORIA

BUILDING FUND

Amount of Fund at 31 December 1978		$5,033
Interest on Investment and Bank Account		453
Amount of Fund at 31 December 1979		$5,486

PUBLICATIONS FUND

Amount of Fund at 31 December 1978		$18,040
Transfer of Flower Book Account from No 1 A/c	$5,797	
Interest on Investment and Bank Account	1,923	
Surplus (Loss) for the year from—		
Ferns of Victoria and Tasmania	1,652	
Wild Flowers of Wilson's Promontory National Park	6	
Birds of the Dandenongs	2	
Flower Books	59	
		9,439
Amount of Fund at 31 December 1979		$27,479

CLUB IMPROVEMENT ACCOUNT

Amount of Account at 31 December 1978		$4,779
Book Sales Account Profit		638
		$5,417
Less —		
Purchase Library Books & Equipment transferred to Surplus Account		136
Amount of Account at 31 December 1979		$5,281

EXCURSION FUND

Amount of Fund at 31 December 1978		$2,326
Add —		
Interest received on Investment	$750	
Surplus on Tours	747	1,497
		3,823
Less —		
Transfer Centenary Excursion Account		1,500
Amount of Fund at 31 December 1979		$2,323

Field Naturalists Club of Victoria

Statement by the Members of the Executive Council

In the opinion of the members of the Executive Council of the FIELD NATURALISTS CLUB OF VICTORIA, the accompanying Balance Sheet is drawn up so as to give a true and fair view of the state of affairs of the Club as at 31 December 1979, and the accompanying Statement of Income and Expenditure is drawn up so as to give a true and fair view of the Financial results of the Club for the year ended 31 December 1979.

Signed in accordance with a resolution of the Executive Council on 25th March, 1980. B. Smith President

D.E. McInnes Treasurer

Statement by the Principal Accounting Officer

I, Daniel E. McInnes, being the officer in charge of the preparation of the accompanying accounts of the FIELD NATURALISTS CLUB OF VICTORIA for the year ended 31 December 1979 state that, to the best of my knowledge and belief, such accounts give a true and fair view of the matters required by Section 162 of the Companies Act 1961, to be dealt with in the accounts.

Signed at Melbourne on the 25th day of March 1980. D. E. McInnes

Auditors' Report to the Members of the Field Naturalists Club of Victoria

In our opinion —

(a) The attached balance sheet and income and expenditure account are properly drawn up in accordance with the provisions of the Companies Act, 1961 of Victoria as amended and so as to give a true and fair view of:—

(i) the state of affairs of the Club at 31 December, 1979 and of the results of the Club for the year ended on that date;
and

(ii) the other matters required by Section 162 of that Act to be dealt with in the accounts.

(b) The accounting records and other records, and the registers required by that Act to be kept by the Club have been properly kept in accordance with the provisions of that Act.

DANBY BLAND PROVAN & CO.
Chartered Accountants
R. M. BLAND
Partner

Richmond
25th March 1980

Field Naturalists Club of Victoria

Reports of FNCV Activities

General Meeting, 14 January

Mr Alan Morrison showed slides which he took last September, from around Mootwingee, which is 80km north east of Broken Hill. The slides showed the dry area, rock formations and flora of the region, including Sturt's desert pea flowering in abundance. Mr Morrison also had a slide of a large eagle's nest in the only available nesting site, a low tree.

Dr Brian Smith had slides of two early naturalists, John Henry Gatliff and Charles John Gabriel, and gave a brief outline of the life of each man. Mr Ron Kershaw and Dr Smith have recently published a book on snails, which Dr Smith showed.

The Librarian, Miss Lester, displayed a "layman's guide" in different sections of natural history.

Mr McInnes had under the microscope a specimen of Utricularia showing the bladders, as well as one specimen of Azolla from northern Victoria, and another from the southern part of the State. He explained how to tell them apart. Other exhibits included plant species in flower, weevils and a cocoon of the swift moth. The Mammal Survey Group reported having seen a brush-tailed rock wallaby at Suggan Buggan.

Among the correspondence was notice of a symposium on "the effects of introduced plants and animals into Australia", to be held at Rusden College on July 27th. The papers will be published in the 1981 Naturalist. Other correspondence concerned a submission by the Club regarding logging at Mac's Creek Valley, and the need for information about Nowa Nowa — Lake Tyers.

General Meeting, 11 February

The President began the meeting by announcing the recent deaths of two members, Mrs May Hampton, who was very active in Club excursions, and Mr Les Chandler. Mr Fairhall read an extract from "the Sunraysia" newspaper which referred to Mr Chandler's involvement in local activities, his concern for Hattah Lakes, and the many articles he wrote. A minute's silence was observed.

The speaker for the evening was Dr Martin Gomon, Curator of Fishes at the National Museum of Victoria. Dr Gomon began by tracing the history of the recording of fishes in Australian waters, and illustrated his part of his talk with slides of illustrations from the journals of some of the early explorers. He then talked of the research work he is doing at the Museum, including a description of a trawling expedition off Portland on a commercial trawler. It is assumed that approximately one third of the fishes off the Australian coast are unknown. Dr Gomon's talk generated a number of interesting questions among which was one relating to the methods of preservation of specimens for study.

The exhibits under the microscope, shown by Mr McInnes, were the larvae of the fly Stratoomys and the aquatic larvae of the fly Ceratopogon. Slugs and the largest carnivorous snail, all collected from Mt Erica, were shown. Wendy Clark had the nest of a brown thornbill, a huntsman spider that appeared to have been paralysed by a wasp, and plant specimens from Brimbank Park, Keilor.

Correspondence was tabled for inspection and progress on arrangements for the Centenary meeting was reported.

(Continued from page 46)

GROUP MEETINGS

All FNCV members are invited to attend any Group meetings, no extra payment.

At the National Herbarium, the Domain, South Yarra, at 8.00 p.m.

First Tuesday in the month — Mammal Survey Group

Tuesday, 6 May. Identification of mammals — new method.
Tuesday, 3 June. Film night.

First Wednesday in the month — Geology Group.

Wednesday, 4 June. Seismology.

Third Wednesday in the month — Microscopy Group

Wednesday, 16 April. Basic transmitted light (the Kohler system). Phase contrast. Oblique lighting and modulation lighting. Incident light versions of each.
Wednesday, 21 May. Simple methods of mounting objects for examination under the microscope. Dry mounts of all materials.
Wednesday, 18 June. How to prepare slides and mount objects in Canadian balsam, glycerine jelly, euparal and other mountants.

Second Thursday in the month — Botany Group

Thursday, 8 May. Natural history of the Kwangsi Area, South China. Speaker: Dr Elizabeth Turner.
Thursday, 12 June. Fungi in Victoria. Speaker: Dr J.H. Willis.

At the Conference Room, the Museum, Melbourne, at 8.00 p.m.
Good parking — enter from LaTrobe St.

First Monday in the month — Marine Biology and Entomology Group

Monday, 5 May. Centenary meeting FNCV. No Group meeting.
Monday, 2 June. Revision of the beetle genus Paropsis. Speaker: Mr Peter Kelly.

GROUP EXCURSIONS

All FNCV members are invited to attend Group excursions

Botany Group

For details contact Mrs Weatherhead (557 6045)

Saturday, 26 April. Coranderrk, near Healesville.
Saturday, 31 May. Upper Pakenham ferns and fungi.
Saturday, 28 June. Kinglake FNCV property for fungi.

Day Group — third Thursday in the month

Thursday, 17 April. Puffing Billy to Emerald. Leave Belgrave at 11.55 a.m. A connecting train from Flinders St leaves at 10.15 a.m. Return from Emerald at 1.35 p.m. to arrive at Belgrave at 2.05 p.m. Leader: I. Gillespie. Phone 578 1879.
Thursday, 15 May. Carlton walk. Meet at the Royal Society of Victoria, 9 Victoria St, main entrance opposite the Carlton Gardens, at 11.30 a.m. Leader: C. Gill. Phone 836 8016.
Thursday, 19 June. Coburg Park Reserve, Murray Rd. Meet 11.30 a.m. North Coburg tram, no. 19, along Elizabeth St to stop 41 in Murray Rd. Leader; I. Gillespie. Phone 578 1879.

Mammal Survey Group

For excursion details contact Ray Gibson (874 4408)

Saturday, 10 — Sunday, 11 May. Buxton camp.
Saturday, 14 — Monday, 16 June. Queen's Birthday weekend. Eildon camp.

Geology Group

Sunday, 11 May. Spring Gully, Bendigo. Leader: Frank Robins.
Sunday, 6 July. Building stones of Melbourne. Leader: Mr Graeme Love.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists

Patron.

His Excellency the Honorable Sir HENRY WINNEKE, K.C.M.G., O.B.E., Q.C

Key Office-Bearers 1977-1978

President:

Dr. BRIAN SMITH, 8 Hunsford Avenue, North Clayton, 3168 (560 8358)

Secretary: Miss WENDY CLARK, 27 Rangeview Grove, North Balwyn, 3104 (859 8091)

Correspondence to: F.N.C.V., National Herbarium, The Domain, South Yarra, 3141

Treasurer: Mr D. E. McINNES, 129 Waverley Road, East Malvern, 3145 (211 2427)

Subscription Secretary: F.N.C.V. C/- National Herbarium, The Domain, South Yarra, 3141

Editor: Mr R. WALLIS, c/- State College of Victoria—Rusden, Blackburn Road, North Clayton, 3168, 544 8544.

Librarian: Mr. J. MARTINDALE, c/o National Herbarium, The Domain, South Yarra, 3141

Excursion Secretary: Miss M. ALLENDER, 19 Hawthorn Avenue, Caulfield, 3161 (527 2749)

Book Sales Officer: Mr. D. E. McINNES, 129 Waverley Road, East Malvern, 3145 (211 2427)

Archives Officer: Mr B. CALLANAN, 29 Reynards Street, Coburg, 3058 (36 0587)

Group Secretaries

Botany: Mr. CAMERON McCONCHIE, 158 Warrandyte Road, Ringwood, 3134 (870 9986)

Day Group: Miss D. M. BELL, 17 Tower Street, Mont Albert, 3127 (89 2850)

Geology: Mr. T. SAULT, c/o National Herbarium, The Domain, South Yarra, 3141

Mammal Survey: Mr. RAY GIBSON, 26 McCulloch Street, Nunawading, 3131 (874-4408)

Microscopical: Mr M. H. MEYER, 36 Milroy Street, East Brighton (596 3268)

Entomology and Marine Biology: c/o National Herbarium, The Domain, South Yarra, 3141

FNCV Kinglake Nature Reserve: McMahons Road, Kinglake.

Bookings and keys: Mr I. F. MORRISON, 788 Elgar Road, Doncaster (848 1194)

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

Subscription rates for 1980

Metropolitan	$12.00
Joint Metropolitan	$14.50
Country Members and Retired Persons	$10.00
Joint Country and Joint Retired	$12.00
Junior	$2.50
Subscription to Victorian Naturalist	$10.00
Overseas Subscription to Victorian Naturalist	$12.00
Individual Journals	$1.75

All subscriptions should be made payable to the Field Naturalist Club of Victoria and posted to the Subscription Secretary

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The Victorian Naturalist

Vol.97, No.3
May/June
1980

Centenary: Field Naturalists Club of Victoria

Published by the FIELD NATURALISTS CLUB OF VICTORIA
in which is incorporated the Microscopical Society of Victoria

Registered for posting as a publication — Category "B"

$1.75

GENERAL MEETINGS

At the National Herbarium, the Domain, South Yarra.

Monday, 9 June 8.00 p.m.

Programme hosted by Microscopy Group.

Monday, 14 July 8.00 p.m.

Speaker: Dr D. M. Churchill, Director, Royal Botanic Gardens and National Herbarium.
Subject: Cooperation of the Herbarium with laymen botanists.

Monday, 11 August 8.00 p.m.

Programme hosted by Mammal Survey Group.
Speaker: Mr Bob Warneke, Arthur Rylah Research Institute.
Subject: Forest mammals research units.

New Members — May/June General Meetings.

Ordinary

Mr Robin Benn, 92 Hotham St., Collingwood, Vic. 3066.
Mr Ilkka Bister, 6 Panorama St., Clayton, Vic. 3168.
Mr Joost Brouwer, 904 Drummond St., Carlton North, Vic. 3054.
Miss Jennifer Chappill, 46 Chestnut Avenue, Ferntree Gully, Vic. 3156.
Mr Mark Durre, 12 Cradley Avenue, Kew, Vic. 3101.
Mr H. V. Feehan, 17 Winston Drive, Doncaster, Vic. 3108.
Mr David Forster, 171 Drummond St., Carlton, Vic. 3053.
Miss Vicki Thomas, 8 Oxford St., Burwood, Vic. 3125.
Mr D. Wentworth, 218 Melville Rd., Pascoe Vale South, Vic. 3044

Joint

Mr James and Mrs Kerryn Robinson, 4/18 Tennyson St., Burwood, Vic. 3125.

Country

Mr Gary Backhouse, Snobs Creek Hatchery, Private Bag 20, Alexandra, Vic. 3714.
Mr Peter Bradley, 30 Tiverton Drive, Mulgrave, Vic. 3170.
Mrs N. E. Clark, 24 Adair St., Scullin, A.C.T. 2614.
Mr L. E. Conole, 15 Clarence St., West Geelong, Vic. 3218.
Mrs T. Downs, 27 White Cres., Campbell, A.C.T. 2601.
Mr Dale Gibbons, 70 Jacob St., Bendigo, Vic. 3550.
Mr Kevin Tolhurst, Victorian Forestry School, Creswick, Vic. 3363.

FNCV EXCURSIONS

Sunday, 6 July. Building stones of Melbourne. Leader: Mr G. Love. Meet at the National Museum of Victoria main entrance in Russell St. at 10.45 a.m. Bring picnic lunch.

Sunday, 3 August. Jumping Creek Reserve and Pound Bend. Leader: Mr I. Morrison. Coach will leave Batman Avenue at 9.30 a.m. Fare $5.00. Bring one meal.

Sunday, 7 September. Mornington Pensinsula with leaders from Botany Group.

Preliminary Notices:

Saturday, 1 — Saturday, 8 November. Wilson's Promontory. A special week in our centenary year when all members are invited to join a combined outing to a National Park closely linked to the history of the FNCV. The National Parks Service is cooperating with us and there will be guided walks and talks on the natural history of the area. Check with Excursion Secretary about accommodation remaining, and please let her know if you intend camping. A coach has been chartered for the week. The cost will be approx. $35.00 per person and must be booked separately from the accommodation through the Excursion Secretary. Deposit $5.00. The deposit of $10.00 should already have been paid to the Excursion Secretary: balance is to be paid to National Parks Service on arrival.

Saturday, 17 — Saturday, 24 January, 1981. Mt Kosciusko. The party will leave Melbourne by coach, staying at Orbost overnight, then on to Wilson's Valley for five nights. On the return journey, the party will stay overnight at Corryong. Accommodation, D.B.B., and coach fare will be approx. $250.00. Deposit $20.00. Book with the Excursion Secretary.

SPECIAL STUDY TRIPS

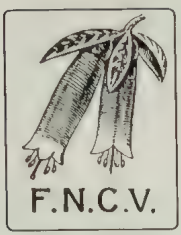
Contact the Secretary 859 8091 (AH), for all enquiries and indicate whether you require transport or can take a passenger.

Saturday, 21 — Sunday, 22 June. Mammal camp. Mt Strickland area (near Acheron Way). Leader: W. Clark and Mammal Survey Group. Start 12.00 noon Saturday; conclude 4.00 p.m. Sunday. Contact secretary for map and further details. Bring all your camping gear.

Saturday, 19 July. Fungi and forest types, Buxton area. Meet at 9.30 a.m. at Lilydale station to arrange transport. Train leaves Flinders St. at 8.37 a.m. Meet at 10.30 a.m. at corner of Maroondah Highway and Project Road (7 miles past Narbethong). Conclude approximately 4.30 p.m. Bring lunch.

Sunday, 17 August. Geology and forest types compared with Buxton — Cathedral Range. Meet at 8.20 a.m. at Camberwell station to arrange transport. Train leaves Flinders St. at 8.06 a.m. Meet at 10.30 a.m. at the corner of Maroondah Highway and Cathedral Lane. Conclude approx. 4.30 p.m. Bring lunch.

(Continued on page 139)



The Victorian Naturalist

Volume 97, Number 3 May/June 1980

Editor: Margery J.Lester
Editorial Committee 1980: Helen Cohn, Margaret G. Gorrick, Reuben D. Kent, Brian J. Smith

Cover: Apart from the once-in-a-hundred-years announcement, this is another change in appearance (see page 98 & 100) with title in a classic dateless type, narrower colour strip at bottom to allow a larger photo, and the badge removed to this page.

A Century and Beyond

BY BRIAN J SMITH, FNCV PRESIDENT 1980

On this occasion of the Centenary of the Field Naturalists Club of Victoria it is natural that we look back with a feeling of nostalgia and pride. The past achievements of the Club are many and varied and over the hundred years we can say that Victoria has been a better place because of the existence of the FNCV. The details of the past hundred years are well documented by the papers in this Centenary *Naturalist* and include such highlights as the continued publication of the *Victorian Naturalist*, the scientific and conservation work sponsored by the Club and the establishment of the Australian Natural History Medallion.

At this time of delving into the history of the FNCV, it is important to remember that the Club has never been stronger than it is today. We have grown from 54 original members in 1880 to more than 900 members and affiliates today. There are five active groups, each catering for the special interests of members and providing focal points within the Club for a deeper study into particular aspects of natural history. These special groups are Microscopical, Botany, Geology, Mammal Survey, and Marine Biology and Entomology.

At its inception the Club provided a meeting place for the professional scientist and the amateur field naturalist. Each gained from the association; the former in having access to the bush-lore and field experience of the naturalist; the latter in the sharing of the depth and breadth of knowledge of the trained scientist. In the middle years of the Club these two groups seemed to diverge and one suspects that the Club was the poorer for this. However, the wheel appears to have gone full-circle, as the renewed awakening in the community for the conservation of our natural heritage gathers momentum.

Today the Club is again providing a vehicle for the expressing of informed community concern for the conservation of nature. Plant and animal surveys of particular areas are being carried out, and documented cases presented to the planning authorities about the proper, long term usage of our resources. I feel that this function of the Club will continue and expand, and that the FNCV will become known as a body whose statements on conservation matters will become increasingly respected as reasoned arguments based on a foundation of fact.

Important as this aspect of the Club's function is, I expect that in the next fifty years an even more vital role will emerge for the FNCV within the community. In today's technological advances a changing way of life will gradually emerge for people. We will have more leisure time and in general people will be better educated with a greater background of knowledge of the world. Increasingly I see the role of the Club as a vehicle for educating the public about the natural world and making it possible for them to have first hand experience of the wonders of nature.

I hope the next 100 years for the Field Naturalists Club of Victoria are as successful as its first Century and that in 2080 the members can look back with as much nostalgia and pride as we do now.

The First Century of the Field Naturalists Club of Victoria

BY J.H. WILLIS*

Introduction

What greater honour could an old Victorian naturalist, of 48 years membership, desire than an invitation to write the centenary story of the Club? Yet one rather shrinks from attempting to bring together those myriad strands of personalities, events and achievements that go to make up a hundred years of history. So much has been written before at certain milestones of the Club, that whatever is said now will be largely repetitive.

For instance, in 1906 Francis Barnard (editor for 33 years) reviewed the Club's activities at the end of its first quarter century; see *Vict. Nat.* **23**: 63-77. In 1920 he continued his historical account at the Club's 40th anniversary *(Vict. Nat.* **37**: 71-78) and at the 50th *(Vict. Nat.* **47**: 39-50).

The diamond jubilee May 1940 was marked by E.E. Pescott's masterful "Sixty Years of Work: The Story of the Field Naturalists' Club of Victoria, Year by Year" in *Vict. Nat.* **57**: 4-31. A last major historical summary appeared in August 1950 *(Vict. Nat.* **67**: 61-76) honouring the Club's 70th anniversary. At a special meeting in Scots Church Hall on 13 July, five brief addresses were given, leading to the printed symposium of the August issue.

Three significant events took place at that memorable gathering in 1950. The then Governor of Victoria, His Excellency General Sir Dallas Brooks, conferred his patronage on the Club; the Australian Natural History Medallion was presented to its first lady recipient, Mrs Edith Coleman; and the Club received its Certificate of Incorporation from Mr Charles Bryant (solicitor and esteemed ornithologist). Henceforth the FNCV would be empowered to own real estate and delete that apostrophe from the word *Naturalists'*. President Ern Lord's concluding words bear repetition:

> The field naturalist of the future faces an almost frightening task — the task of guarding a natural asset for a world to come. We have seen the destruction to our own time and the pace is accelerating. Are there men and women in the Club big enough to meet this future?

After 30 more years our task is still daunting enough, demanding constant vigilance, mobilization and some campaigning to preserve what is left of our wildlife heritage and to prevent ecological disasters. But the impact of a nation-wide conservation movement has given encouragement over the past decade and several notable victories have been won.

The Club's 80th and 90th birthdays went unheralded, so we must duly signalize the 100th.

Origins of FNCV

Philosophical societies, embracing the study of natural history, sprang up quite early in the history of our Australian colonies: at Sydney in 1821, Hobart 1838, Adelaide 1853, Melbourne 1854, Brisbane 1859, with Western Australia rather late with its Mueller Botanical Society in 1897. All these bodies were forerunners of the various Royal Societies now existing in each State.

About a century ago the need was felt for clubs that would provide a more popular and sociable approach to natural history, involving members in excursions to the countryside, specimen

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Charles French was the main initiator of the FNCV in May 1880. At that time he was working with Mueller at the Botanic Gardens, but later became Victoria's first Government Entomologist. He wrote many papers for the *Naturalist* both on plants and insects. Charles French died in 1933. Photo: FNCV archives.

collecting and friendly sharing of observations at regular meetings.

The honour of being first in this field is claimed by Victoria where the present FNC was established at Melbourne in May 1880 under the presidency of Professor (later Sir) Frederick McCoy. Within a month or two (also in 1880) Geelong had founded its own FNC with Mr J. Bracebridge Wilson as its first president. The Field Naturalists' Section of the Royal Society of South Australia (Adelaide) began in 1883, and the Naturalists' Society of New South Wales (Sydney) also originated in the 1880s.

In his excellent summary, "Sixty years of Work . . ." *Vict. Nat.* **57**: 4-31, Edward Pescott chronicled the principal personalities and events of our Club's history at that time. His comments on *The Genesis of the Club* are worth repeating:

In the middle seventies a small band of young men interested in natural history were wont to foregather, usually on Sunday mornings, to discuss their problems and display the "finds" collected on their Saturday and Sunday outings. Their meeting place was the residence of Charles French at the Anderson Street frontage of the Melbourne Botanic Gardens, where Mr French was propagator under Baron von Mueller. The chief "spirits" of these gatherings were Dudley Best, D. Kershaw, F. Barnard, J.E. Dixon and occa-

sionally one or two others. By special favour young Charley French was allowed to be present. In vain Mrs French would call her husband to dinner, giving the others a broad hint to go home; but it was always difficult to get rid of them, so entrancing were their talks . . . One day Charles French said "We ought to have a natural history club."

The idea took root. French and Best signed an advertisement calling for a meeting at the Athenaeum Hall on 6 May 1880. About 30 men attended and Dr T. P. Lucas was voted into the chair. This meeting resolved to form The Field Naturalists' Club of Victoria, appointing a committee to draw up rules of management which would be discussed at a further meeting on 17 May. At the latter meeting the rules were adopted, office bearers and committeemen elected, and an inaugural meeting of the Club planned to be held at the Melbourne Town Hall on 14 June, when the proceedings of the two May meetings would be confirmed and new members enrolled; the annual subscription was fixed at ten shillings.

Additional members were admitted at the succeeding general meeting held in Temperance Hall (Russell Street) on 12 July 1880. At that date membership numbered 54 and all these were subsequently referred to as "original members".

A glance at the list of original members reveals a high percentage of erudite men: scientists of the stature of Mueller, McCoy, Ellery, French, Kernot and LeSouef, the Reverends Halley and Spicer, the Hon F.S. Dobson, also many excellent amateur scientists and educationists. Within a few years such other notables as Professors J.J. Gregory and W. Baldwin Spencer, A.J. Campbell, J.A. Kershaw, A.H. Lucas, T.S. Hart, A.W. Howitt and J. Searle had thrown in their lot with the Club — truly a prestigious organisation by the 1890s. Nowadays the proportion of scientists and academics in the Club is much lower, doubtless because of an increasing number of specialist societies that better meet their needs.

Clubrooms

The new Club met for a year at the Temperance Hall. In mid 1881 it transferred to the Royal Society's Hall in Victoria Street which continued to be its official home over the ensuing 64 years — until June 1945 when extensive remodelling of the old R.S. Hall forced the naturalists to accept alternative accommodation in the lecture hall of the State Library, Swanston Street.

This change proved rather inconvenient. There was no space for Club equipment and the room had to be vacated no later than 10pm when an attendant came to shoo out any lingerers; a harassed FNC Treasurer would often be seen handling subscriptions and writing receipts on the front steps of the Public Library, outside closed doors!

After 2¾ years of such makeshift housing, it was a relief to find sanctuary at the National Herbarium in March 1948. And there we have happily remained, with use of facilities and space to house equipment and the Club library.

The Herbarium became our official headquarters in 1955.

Outings

Excursions have always played an important part in Club activities, the first one being a "field day" at Brighton on 19 June 1880 — only five days after the inaugural meeting. Brighton was a popular venue for many years — excursionists travelled by train to Brighton Beach, then walked across coastal heaths to Red Bluff and Rickett's Point where fossil shark's teeth were a prime attraction. Other popular places for a day's visit were Oakleigh, parts of the Yarra River, Lilydale and the You Yangs.

It was customary to mark the birthday of the Prince of Wales (9 November) by some special outing, and the geological excursion to Lal Lal Falls in November 1885 must surely rank as the most colourful in the Club's annals. The party

alighted from a morning train at the nearest convenient station; there they were met officially by the President of Ballarat FNC mounted on piebald pony and accompanied by a piper who dispensed rousing music all the way to the Falls on Moorabool River! Buggies were provided for lady excursionists but they preferred to walk on such a salubrious spring morning. Lunch was enjoyed at the Falls and, although rocks were enthusiastically examined and the area's geology explained by the geological lecturer from the Ballarat School of Mines, the report in the *Victorian Naturalist* reminds us that:

> Geologists tapped not only rocks but bottles of claret, entomologists carved hams, botanists were busy with sandwiches, and then the young, and not so young too, were tempted to dance to the piper's tune.

The Club's first "camp-out" was held on Olinda Creek near Lilydale during the long weekend 7-10 November 1884. About 20 members participated and the event was highly successful. It was during this camp that a nest with eggs of the now rare Helmeted Honeyeater was first collected.

Phillip Island provided much of interest for the Club's next camp in 1887, while during November of that year a more ambitious visit was made by 26 members to King Island, Tasmania. This was the first of four notable expeditions to islands in Bass Strait, others being the Kent Group (Nov 1890), Furneaux Group (Nov 1893), and lonely Albatross Island (Nov 1894). Lists of the higher plants and birds observed were published in the *Naturalist*, Baron von Mueller having checked the former and A.J. Campbell the latter.

Accounts of long excursions in the early days of the Club stimulate one's excitement and engender admiration of those doughty pioneers who ventured into rough trackless country. Baldwin Spencer's report (*Vict. Nat.* 6: 1-38) of the exploratory "Trip to Croajingalong" in 1889 is a classic of its kind. The narrative (*Vict. Nat.* 7: 157-79) of a tramp in March 1891 from Marysville over the mountains to Yarra Falls near the Baw Baws by six intrepid members who experienced soaking rain for days on end, reads like a fantasy by contrast with the comforts of fast-moving

Some of the 26 FNCV members who went to King Island in November 1887. Like most of the other photos in the King Island album, this provides no clues as to the persons pictured. Photo: FNCV archives.

modern excursions in parlor coaches along sealed highways.

In October 1927, thanks to a $400 gift from an anonymous donor, the Club mounted a camping expedition through the Western District of Victoria, the five-man party concentrating its effort in and around the Grampians. Reports of the geology, botany and insect life were published as a supplement to the *Naturalist (Vict. Nat.* **45**: 5-52). Two ant and two beetle species were described as new.

August 1960 was significant for a Club excursion to Central Australia, the first interstate venture this century. Since then there have been excursions to areas in all Australian States and to Kangaroo Island, King Island (by air and coach — how different from the boat and camping expedition of 1887), Flinders Island and even to New Zealand. The itineraries and highlights of these pleasurable ventures were reported in the *Naturalist.*

The Victorian Naturalist

Origin. A committeeman at the inauguration of the Club (June 1880) was printer and publisher Joseph Wing. Later that year, Mr Wing founded (and owned) a monthly journal called *The Southern Science Record,* copies of which sold for sixpence. In addition to short scientific papers, Wing's *Record* set out the "Proceedings of Societies" — reports on recent meetings of the various scientific bodies and naturalists' clubs in Australia and New Zealand. It ran for 42 parts from 1880 to 1886, but later issues appeared quite irregularly.

At first, the *Record* afforded a very convenient medium for the young FNCV to publish its notices, meeting reports and sundry articles by members. Thus, the first article in Part 1 of the *Southern Science Record* December 1880 is an account of our Victorian ferns (continued in subsequent issues) by the Club's founder, Charles French. So many valuable records appeared in Wing's journal that one must consult it for information on the early work of FNCV members.

But inadequate space in the *Record,* and irregular production, finally decided the FNCV to bring out its own monthly journal. Number 1 of *The Victorian Naturalist* was issued in January 1884 with Mr A.H.S. Lucas as Editor. Concurrent with Wing's struggling *Record,* the new *Naturalist* virtually killed the former journal.

The contents of the *Naturalist* from 1884 to 1980 are in fact the recorded history of the FNCV; therein can be found its struggles, excitements and achievements. Some of those events have been mentioned, but the most valuable contents are the articles on natural history. In the *Naturalist,* observations and assessments of Victoria's natural history have been recorded for almost a hundred years. To cite the many notable contributions would be interminable, and here can be mentioned only the main trends.

Natural history. The first article in the *Naturalist,* as in the *Record,* was one of a series of papers by Charles French, this time on Victorian orchids. Baron von Mueller followed with the second article in that first issue. By the time of his death in October 1896, Mueller had published no less than 121 **new** species of plants in the *Naturalist* — an average of one every month! Since then another 237 botanical novelties have been described in our journal.

This botanical bias persisted in the Club's writings for more than 80 years, and botany is still well represented in the pages of our journal. Many notable botanists, professional and amateur, past and present, have recorded their findings and knowledge in the *Naturalist* — information that is still valuable and relevant.

Entomology got away to a propitious start in the early outpourings of Charles French (the Colony's first Government Entomologist) and his son Charles

French Junior. Until recent decades, this subject has claimed more adherents in the Club than any other branch of zoology.

Birds have always had a high appeal and have been favourite subjects for observation and research by Club members. The *Naturalist* carries innumerable articles by recognised ornithologists. However, birds have been less well represented in our pages since the Bird Observer's Club started its own newsletter in 1931 that has developed into a specialist journal.

Mammals did not occupy much space in the early Naturalist but since the 1960s, with the aid of grants from the M.A. Ingram Trust, much more has been published. There are descriptive accounts of certain species and, more recently, reports of mammal surveys of particular areas.

Geology and physiography, anthropology, reptiles, pond life, marine life, cryptozoic life, have all had their specialists and writers of distinction who have contributed to our journal.

Indeed, the *Naturalist* contains a wealth of information on every aspect of natural history in this State, much of it being an essential basis for future work. With the publication of the Author Index in 1976 and Subject Index in 1979, such information is now more readily located.

Quantitative matters. The *Naturalist* contains contributions from 1227 different authors known by name, and about another 330 contributions from anonymous writers. Many contributors produced only a single note or article, but others wrote four times or more and the most prolific reached their century; one contributed 188 items during 46 years!

The Victorian Naturalist is now larger in volume than all other journals of similar Australian clubs and societies put together.

From its inception in 1884 to 1923 (40 years) the *Naturalist* cost only six pence. Within the next four years it had trebled in price to 1/6 in 1927. In the depression year of 1932 (June) the price came down to 1/-, remaining thus for another long period of 15 years, then rising again to 1/6 in July 1947. Since that time costs have only been upward as follows: July 1951 2/-, July 1952 2/6, May 1965 3/6, February 1966 35c, Jan 1968 45c, Jan 1975 75c, March 1976 $1.20, Jan 1979 $1.75.

Illustrations, covers, etc. First illustrations in the *Naturalist* appeared in the June 1889 issue; they were lithographs to Spencer's account of the Croajingalong expedition. First photographic reproductions were of gannets on Cat Island, Furneaux Group, in the issue of February 1894.

It was not until May 1932 that the first colour plate appeared in the *Naturalist* — a study of tropical "crinoline" fungi from a painting by Mrs Ellis Rowan. Two other fungal pictures in colour adorned the issue for April 1934 and the then-editor, Charles Barrett, was not in favour with Council for incurring high expenditure on such lavish features; his editorial practice was to "do first and argue later". Colour illustrations have continued to be few but, thanks to the M.A. Ingram Trust, several mammals have been pictured in colour in issues of the 1960s.

Time has witnessed changes in the journal's covers, paper quality and format, some being; Jan 1906 — adoption of a Club emblem (the small shell *Niotha pyrrhus*) which henceforth appeared on the journal and stationery; Jan 1928 — emblem changed to the flowers of *Correa reflexa*, still in use after 52 years; May 1950 — although advertisements had appeared on outside back cover of the *Naturalist* for several years, it was now deemed necessary to sell advertising space inside the journal, a practice discontinued three years later; May 1959 — completely changed format under N.A. Wakefield's editorship with entire journal printed on art paper,

Cabbage Tree Palms *Livistona australis* R.Br. — one of the first illustrations to appear in the *Naturalist*. Five lithographs were made from Baldwin Spencer's sketches of the Corajingalong expedition in January 1889 and were reproduced with his account in June 1889.

photograph on front cover, and two columns of text instead of lines extending right across the page; Jan 1966 — volumes began to run from January to December; Jan 1976 — journal became bimonthly and annual index a "lift out" sheet.

Editors and printers. Editors are particularly dedicated, hard-working people, and in the 96 years of the *Naturalist* there have been only 13 of them. The first four collectively reigned for 64 years, half that period being blessed by the services of Francis G.A. Barnard; he was also a prolific writer and a gifted all-round naturalist, becoming almost an institution in his day. Here is a list of the editors:

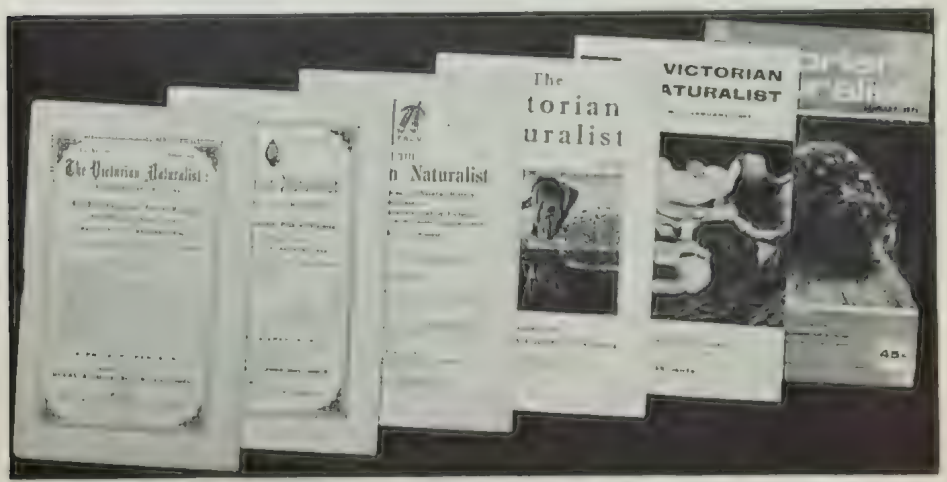
A.H.S. Lucas 1884-93, F.G.A. Barnard 1893-1925, C.L. Barrett 1925-39, A.H. Chisholm 1939-48, J.H. Willis 1948-51, Ina M. Watson 1951-52, N.A. Wakefield 1953-57, A.B. Court 1957-58, N.A. Wakefield 1958-64, J.R. Hudson 1964-66, G.M. Ward 1966-75, Margery J. Lester 1976, Reuben Kent 1977-78, Robert L. Wallis 1979-.

The success of any magazine is in large measure dependent upon the expertise of its printer and his interested co-operation with the editor. Only seven printing firms have been involved with *The Victorian Naturalist* and, between them, two firms gave fine service to the Club for 74 years — Walker May & Co (1889-1924) and Brown Prior Anderson (1931-69). Jenkin Buxton Printers have been carrying on this service for the past decade.

Other publications

The first handbook issued by the Club *A Census of the Plants of Victoria with their Regional Distribution and Vernacular Names* (1923) evolved from years of work by the first Plant Names Committee. The committee had been set up at the suggestion of Professor A.J. Ewart. For an enlarged and revised edition of the *Census* in 1928 we are indebted to the efforts of Herbert B. Williamson.

Some publications were achieved through compilation of articles already printed in *The Victorian Naturalist.* In 1926 H.B. Williamson produced a series of nine illustrated articles in the *Naturalist* on "Victorian Ferns" *(Vict. Nat.* **42** & **43**). These formed the basis of the FNCV handbook *Victorian Ferns* by Richard Bond & Charles Barrett (1934). In 1955, under a new title *Ferns of Vic-*



The changing face (and price) of the *Naturalist.* From the first issue in January 1884 right through to today, the selling price has always been below cost. Of course, that is largely due to the small quantity printed of each issue — about 1200 at present. Photo: Bruce Fuhrer.

toria and Tasmania, N.A. Wakefield brought out a much enlarged revision. After Wakefield's untimely death (1972), his book was further revised by J.H. Willis (1975) and has been reprinted twice — in 1976 and 1977. In fact, our Fern book has been one of the big success stories in FNCV publishing history. It is interesting to observe that these fern books contain many of the line drawings made by H.B. Williamson when he produced the original articles in the *Naturalist*.

The second handbook published by the FNCV was *Victorian Sea Shells* by Charles J. Gabriel in 1936. It is illustrated by line drawings and half-tone drawings, and proved a boon to our enthusiastic beachcombers.

Some colour plates on fungal subjects appeared in the *Naturalist* in 1932 and 1934, the issue for April 1934 *(Vict. Nat.* **50**) being enlarged and devoted entirely to Victorian fungi. This was the precursor to another successful handbook, *Victorian Toadstools and Mushrooms* by J.H. Willis. It ran to four editions — 1941, 1950, 1957 and 1963.

In the *Naturalist* of 1947 appeared "A Key to the Identification of Australian Snakes" by R.A. Hunt, and it was produced soon after as a booklet.

In 1965 we published *The Vegetation of Wyperfeld National Park* by J. Ros Garnet. Unfortunately there was no second printing of this book and, with the increased mobility of the population, it is in even greater demand than formerly.

In some cases the FNCV has associated with other publishers. *Wildflowers of Wilson's Promontory National Park* by J. Ros Garnet was published in association with Lothian (1971). *Flowers and Plants of Victoria* by Cochran, Fuhrer, Rotherham and Willis, published in association with A.H. & A.W. Reed (1968) with 543 colour plates, has proved a real money-spinner in royalties to the FNCV.

The *Author Index 1884-1975* (1976) and *Subject Index 1884-1978* (1979) to the *Naturalist* have proved invaluable. The former was compiled by the late James A. Baines. The need for a comprehensive subject index had been recognised for a long time, but it was not until 1971 that the *Subject Index* was really tackled. Under the guidance of Kathleen E. Hall, a team worked at the immense undertaking for a couple of years. It then entailed more team work by other Club members to prepare it for publication. It is sad that Miss Hall did not survive to see the final result.

Specialization and Groups

There have been sundry standing committees of the Club to deal with specific ongoing activities. For instance, the *Naturalist* for August 1950 lists five (with their respective convenors and memberships) — National Monuments and National Parks, Excursions, Youth Movements, Plant Names, and Maranoa Gardens Standing Committees. Then there were the various Discussion Groups which now play such an integral part within the framework of the Club.

The Discussion Groups were spawned from the old, informal and exciting meetings of the "Gang" in Stan Colliver's private home during the 1930s and 1940s. (See his reminiscences communicated by J.A. Baines in *Vict. Nat.* **94**: 174-76, August 1977). It was increasingly felt that the monthly meeting nights afforded little time or scope for specialist members to share their interests with kindred minds.

So, in 1946, the first three Discussion Groups were formed — Geology under the leadership of Mr A.A. Baker, Botany under the late A.J. Swaby, and Natural History Photography under the late H.T. Reeves. The Groups met on evenings other than the general Club nights, sometimes in a member's home.

Marine Biology was the next Group to be established (1947), but some years later Entomology was added to the title. The Wildflower Garden Group had a

brief existence from 1948.

Then came the Native Plants Preservation Group under Miss Winifred Waddell (Nov 1949). In February 1952 this Group separated from the FNCV to form an independent Society. The Society still flourishes, but many people hold membership in both organisations.

A Microscopical Group was set up in 1954 providing a home for former members of the now incorporated Microscopical Society of Victoria.

Fauna Survey (founded in April 1960) changed its name in January 1967 to the more restrictive Mammal Survey Group. The Field Survey Group (founded in 1972) with interests in cryptozoic life, passed into recess in 1976 when its leading enthusiasts went to other States.

Much good solid work in natural history has emerged from the combined activities of these enthusiastic "cells" since the first of them began to function 34 years ago.

More recently, some members not particularly concerned with specialised study or research have formed the Day Group. Its meetings and outings cater for the not so young or less agile who find it difficult to attend night functions.

A very useful and inexpensive magnifier is the "FNCV microscope" designed and produced by Messrs W. Woollard and D.E. McInnes in 1962. It has proved to be an admirable tool for study purposes among several of the Groups.

Branches

In 1943 the late Mrs M.E. Freame (ardent marine biologist) and Mr Paul Fisch established a suburban branch for junior naturalists at the Hawthorn Town Hall. Beginning in a very humble way, the Hawthorn Junior FNC has gone from strength to strength; it has encouraged and nurtured many budding biologists and runs its own monthly journal. Mrs Freame remained the secretary for 15 years, and youngsters who joined the Club during her time would now be middle-aged. For the last decade the Club has been wholly run by the Juniors themselves — under 25 years age.

Other but smaller junior clubs sprang up in Prahran (1954), Preston (1964), Montmorency (1969) and Pascoe Vale, but some have waned for lack of support or leadership. An independent junior naturalists club (now no longer junior) has flourished at Black Rock for several years, also at Ringwood.

The FNCV in Melbourne has always endeavoured to encourage and, where possible, to assist the formation of country naturalists' clubs. Especially since World War II these regional bodies have mushroomed and now number some 25, most of them affiliated with the FNCV. Fourteen clubs in the western part of the State have banded themselves into a Western Field Naturalists' Clubs Association, meeting three times a year in different areas to co-ordinate activities; conservation issues are of prime concern.

Conservation Movement

Many present members may shudder at the thought that their forerunners of the 1880s (and later) collected birds' eggs and dug up orchids during excursions! Yet, quite early, a desire to protect and preserve was emerging.

The first conservation campaign to engage the young Club's attention concerned Wilson's Promontory with its richly diversified flora and fauna, not to mention the dramatic scenery. The idea of reservation was first discussed after a trip to the Promontory by some FNCV members in 1884-5 and, in 1898, a temporary reserve was made. Permanent reservation came in 1905, but a half-mile strip around the perimeter remained excised as only "temporarily reserved" — a loophole for the Government to cut off access to the sea if it so wished! Finally, in 1908, permanent reservation was secured for the whole land area of

All this to **remove** (not to photograph) the nest of a Blue-bellied Lorikeet! But light-weight cameras and roll films had not yet been invented so perhaps such vandalism served a useful purpose. Reproduced from the authoritative *Nests and Eggs of Australian Birds* 1900 by A. J. Campbell, FNCV member in its early days. Photo: National Museum.

the Promontory, and the Park has much increased in size since then. Throughout these negotiations spanning 20 years, the FNCV took a leading part. For details of this campaign see Mr Ros Garnet's account in this issue, page 130-31.

Immediately following the proclamation of 1908, Professor A.J. Ewart initiated a series of biological surveys to record the plant and animal life of the Promontory. He was aided by several prominent FNCV members including botanist J.W. Audas who reported in the *Naturalist* on three exploratory trips between 1908 and 1911.

The Club was also involved in the reservation of Wyperfeld National Park, a persistent agitator being A.H.E. Mattingley. It all began with an ornithological journey there by Mattingley in September 1907. Next year he publicised the desirability of reservation by an article in the Melbourne *Argus* (31/8/1908) and waited on the Surveyor-General who was sympathetic. The result was a temporary reservation of 9600 acres in 1909.

Mattingley's continuing battle for permanent reservation was interrupted by World War I. However, the National Parks Association succeeded in achieving reservation in September 1921 with an extra 6400 acres. Further additions were secured at various times and Wyperfeld National Park now comprises about 140,000 acres.

FNCV members had fingers in the pie concerning the establishment of other national parks. Sperm-whale Head 1927 (now included in Lakes National Park) was the brain-child of A.D. Hardy and the local Barton family. Kinglake was established in 1928. Mr Hugh Stewart was a doughty champion of Mount Buffalo National Park (gazettal of 1898), visited the area frequently and published several papers on that subalpine reserve in the *Naturalist* from 1937 to 1953.

Mr Phillip Crosbie Morrison (FNCV President 1942-43) was a towering figure in all matters affecting national parks, becoming first Director of the infant National Parks Authority.

A close liaison has always existed between the Victorian National Parks Association and the FNCV; our National Monuments & Parks Movement (inaugurated in 1936) became the nucleus of the new VNPA that arose in

1952. Many people are keen members of both clubs, one of the most active being Ros J. Garnet. Mr Garnet is a former President of both bodies, voluminous writer, and holder of the prestigious Natural History Medallion.

Among other conservational papers, Mr Garnet published a series of 18 informative articles on our "National Parks and National Monuments" (*Vict. Nat.* 1960 & 1961). In writing about the oldest of all (Ferntree Gully 1882) he commented: "Each weekend and holiday there'd be special trains . . . Everyone took home loads of heath, wattle and ferns, and anything else they could lay their hands on. Homeward-bound trains were filled with the choicest wildflowers and ferns from the Dandenong Ranges".

It was vandalism of this kind that caused the FNCV and other bodies to fight for statutory protection of our flora. Now that is happily assured through the Wild Flowers and Native Plants Protection Act of 1930, consolidated in 1958 and more recently amended.

The conservation movement has gained momentum during the past 20 years, and the FNCV is often importuned to support this or that petition, lobby or submission; consideration of such matters absorbs a vast amount of Council's time.

In 1969 many Club members took part in the furore over attempted alienation of the Little Desert for farmland; this would have turned a superb wildlife region into cleared country of dubious viability. The battle received marvellous press coverage, was won, and soon precipitated the legislation for a Land Conservation Council in 1970.

Shows and Exhibitions

Exhibitions of wildflowers and educational displays are a tradition since the early days of our Club. The first recorded Wildflower Show was staged at the Royal Society's Hall in October 1885. Since early days an annual conversazione was usually held in some hall other than the normal meeting place, and the principal feature of such gatherings was the display of natural history specimens.

Eventually, the FNCV decided that its exhibitions ought to be more public. So in the springtime of the War years 1915 and 1916, annual wildflower shows began in the Melbourne Town Hall, any profits being donated to patriotic funds, Anzac House, Children's Hospital or other charity.

For the two years 1925 and 1926 St Kilda Town Hall was the venue, but thereafter back to Melbourne for the next eight nature shows.

The Club's Jubilee Year 1930-31 proved a high-water mark in show activity, no less than three major exhibitions being organised and each running for several days. Shows for 1932 and 1933 were again at the St Kilda Town Hall.

In October 1934, Melbourne's Centenary Year, a tremendous effort was put into our Wildflower Show at Melbourne Town Hall. One recalls its impressive centre-piece — a large pyramid of scarlet waratah heads from New South Wales. Simultaneously the Club mounted a spectacular wildflower exhibit for the Centenary Celebrations in Fitzroy Gardens that lasted a week. Material was railed from country members in good wildflower areas, also from other States (few people grew native plants in those days) and Shell Oil Company co-operated by flying in wonderful banksias, grevilleas, leschenaultias, kangaroo paws, etc from Western Australia. Such gems always took pride of place and somewhat eclipsed the Victorian flora. All this planning, handling and care of exhibits, labelling and duty rosters, involved a few dedicated members in an immense amount of work.

Shows for 1935 and 1936 were in St Kilda Town Hall, then Melbourne again in 1938 and 1939. No shows were held during the six years of World War II

(1940-45) but were resuscitated at Hawthorn Town Hall in 1946. In the 1948 show at Hawthorn, consternation followed the escape of a large python from the reptile cage; it was not found until the show was being dismantled — concealed in the space under a stairway. Far from adversely affecting attendances, this episode caused a veritable rush of curious people!

Five years later N.A. Wakefield revived the Show at Prahran Town Hall (Oct 1953) and there the next two (Nov 56 and Sept 57) were held under the management of A.B. Court. Mr Court also supervised the return to Melbourne (Lower Hall) in Sept 59, when advertising pamphlets included translations into one or more European languages for migrants.

From that date regular annual shows took place in Melbourne's Lower Town Hall under the indefatigable leadership of Mr D.E. McInnes and profits were shared with the Society for Growing Australian Plants which staged magnificent displays of Australian wildflowers — all garden-grown. A strong educational and conservational slant was given to these shows with ecological dioramas, much literature for sale, contributions by junior naturalists, and the screening of good nature films. After eleven consecutive years (1961-71) the Wild Nature Show lapsed again. It seems it will be reborn in this centenary year.

Acquisitions by Gift

It would be tedious to go through the Club's records and list the many members who have made gifts, either of cash, literature or equipment; some substantial donations have been invested in permanent funds for special purposes. But there are some benefactors whose names should not be forgotten.

In 1927, at the suggestion of the nature writer Donald MacDonald, Mr William Lawford of Linton near Ballarat presented to the Club a set of twelve magnificent morocco-bound volumes of Gregory Matthews' *Birds of Australia*. And Mr V.H. Miller presented a cabinet specially made to carry the volumes.

Miss Amy Fuller, who died in August 1944, bequeathed to the Club 230 large water-colour studies of native Australian and South African flowers

Members of Hawthorn Junior FNC crossing swampland on their way to some aboriginal middens during their 1977 Easter Camp at Lake Tyers. Photo: Michael Howes.

painted between 1893 and 1916; about 100 of her other pictures had been purchased by the Kew Herbarium, London. Much use has been made of these paintings at the Club's various exhibitions. See J.H. Willis "Victoria's Lady Wildflower Artist" *Vict. Nat.* **74**: 147-50 (1958).

Two notable gifts of land were made in 1958 and 1974. The former was donated by Mrs Nowlan as a wildlife sanctuary (near Maryborough) in memory of her parents Mr and Mrs W. Cosstick. The latter (at Kinglake) came from the Estate of Mr Harold Frahm, now used for FNCV excursions and convenient for an overnight stay at a small charge.

Within the FNCV there have been very many notable naturalists, many striking personalities who have piloted the Club's affairs, and innumerable less conspicuous members who have helped to carry things along during the past century. With its accomplishments through the lifetimes of so many supporters, the Victorian Field Naturalists Club need have few regrets on this its hundredth anniversary. As expressed on the journal's back cover, our objective remains:

"To stimulate interest in natural history, and to preserve and protect Australian fauna and flora".

Yet how much is implied in those few simple words!

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Contribution to science by early geologists of FNCV

BY EDMUND D GILL*

Geological collecting by pair-horse wagonette

"We hired a pair-horse wagonette, as the (Wannon) Falls are situated twelve miles from the town." So wrote Messrs. C. French and F. G. A. Barnard in the third volume (1887) of the *Victorian Naturalist* when giving an account of "A holiday tour in Riverina and Western Victoria".

They had travelled to Hamilton by steam train. Their story continued. "At the hotel our curiosity was excited by the news that a gentleman had just arrived who intended visiting the well-known fossil beds at Muddy Creek (west of Hamilton) the next day. As we had partly planned the same trip for the morrow, this was an agreeable surprise, and was all the more satisfactory when we found our new visitor was such a well-known naturalist as Mr J. Bracebridge Wilson MA, head master of the Geelong Grammar School, also a member of our Club."

In the 1950s the National Museum of Victoria acquired the very large collection of fossils and minerals of the late Dr G. B. Pritchard when he was in his nineties. It was my task to get from him all the information I could about the collection.

Pritchard's account of a collecting trip to that same locality at Muddy Creek and the nearby one on Grange Burn is brought to mind by the above quotation. He showed me a photograph of a pair-horse wagonette or drag loaded high with their gear as they left Hamilton railway station for their camp. The trip had been very carefully planned, and each had a carrier take his portion of the gear to his suburban steam-train station. Now it had all arrived at Hamilton, and the tents, collecting gear, cooking utensils, food and such were piled high on the hired wagonette, and in high spirits they were setting out for their camp site.

To assess the contribution of the early geologists, it is necessary to realize the circumstances under which their work was done as well as the results achieved. When I first worked at the National Museum no form of transport was available. I recall taking the train to Lilydale station, then walking across country to various fossil localities as far as Yering Gorge near Yarra Glen and then returning to Lilydale. On other occasions a bicycle was taken in the train, then used for travelling the countryside. Shortly after I joined the staff, a Trustee was leaving for England by ship for six months, and he gave the Museum his old car.

Drawing from a very faded photo taken by Dr Pritchard of French and Barnard on their hired pair-horse wagonette. Is the third man Bracebridge Wilson? Drawing: Rhyllis Plant.

While in Hamilton, French and Barnard looked up John Dennant, the School Inspector, who "has been working for some years at the fossiliferous deposits on Muddy Creek, in conjunction with Professor Tate FGS of

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Adelaide, and has now a collection of between five and six hundred species . . . They vary in size from cowries as large as a good-sized coconut to shells as small as dust shot." Dennant (1885) wrote a valuable serial article in the *Naturalist* on the geology of S-W Victoria; it is still useful. The shell beds at Muddy Creek and Grange Burn are among the richest in the world, if not the richest.

The Problem of Classification

Last century there was a most lively interest in the seemingly endless discoveries of new species of plants and animals all over the world. Natural history was the popular interest. Every front room had a glass case of birds, butterflies, fossils, minerals or such.

As naturalists endeavoured to classify this rich array of living things they ran into difficulties which the theory of the time could not explain. Each species was supposed to be a completely separate entity, but they found some kinds that graded into one another. What then is a species, was a question everyone wanted answered.

This is why "The Origin of Species" was a best seller, so controversial at first but now accepted as essentially correct. Natural selection creates species out of the endless variations in nature, tailoring them to match the environments of the time. This is a paradox: on the one hand endless random variations from mutation but, on the other, the organism precisely fitted to its environment. This is a dynamic system ever adjusting itself to the changing ecology. It was a magnificent conception, and in the geologists of our review period we note the struggle to leave old ideas and adapt to the new.

Famous Naturalist and Explorer

One of the most outstanding men of character and science belonging to the early Field Naturalists' Club was Dr A. W. Howitt CMG FGS who was granted a DSC by the University of Cambridge for his outstanding work. Born in Nottingham, England, of a famous Quaker family, he migrated with his family to the Colony of Victoria and worked in the goldfields. Later, Howitt was employed as a magistrate in Gippsland. This isolation meant that the high quality of his work was often overlooked. He had no libraries at hand, no equipment except a microscope, and no colleagues with whom to discuss his observations.

In spite of these disadvantages his work was outstanding. At an international conference (in Paris if I remember correctly), a botanist in a chatting group of scientists told me that he was very impressed with the studies on *Eucalyptus* by a last century Australian botanist named A. W. Howitt. Another member of the group, an anthropologist, said there was some very good work done about the same time on anthropology by a man of the same name. "Was he the botanist's brother?" "They are the same man", I replied, "and he was also a geologist of note. He was outstanding as a bushman and explorer, and his observations were so good that whatever he observed, be it botany, anthropology or geology, it was work of quality. Moreover, he was a man of exceptionally fine character." We all were impressed by the achievements of A. W. Howitt, especially as he worked under such great limitations.

I then told them of the ill-fated, albeit successful, Burke and Wills Expedition (Howitt 1908) that crossed Australia from south to north and back in 1860, and how Howitt went to their rescue. At the time of the centenary of the Royal Society of Victoria in 1959, Professor Kathleen Fitzgerald wrote an excellent article on the Burke and Wills Expedition, and as the then Secretary of the Society I provided needed information. I recall how remarkable she considered it to be that Howitt organized the relief expedition, and so successfully carried it out without fuss or publicity that this

difficult job was made to look extremely easy.

However, in 1863 (when he was only 33) the Government did recognize him by appointing him a Police Magistrate and a Warden of the Gippsland Goldfields. In 1889 he was appointed Secretary of Mines, and in 1896 Audit Commissioner and a Member of the Public Service Board. He retired in 1901 aged 70, but was recalled to sit as Chairman of the Royal Commission on the Goldfields. Still later he served on the Commission that considered sites for the Federal Capital.

It was Professor Sir Baldwin Spencer who in the April issue of the *Victorian Naturalist* in 1908 took nine pages to record Howitt's life and work. He wrote, "Not the slightest notice was taken of his retirement, which was exactly what he himself would have desired, but the members of the service were probably quite ignorant of the fact that they were parting with a colleague who was without doubt the most distinguished man who had ever held office in the public service of Victoria." I think that this is still true.

In 1906 Howitt received the CMG, he was President of the Australasian Association of the Advancement of Science in 1907, and was the first recipient of the AAAS Mueller Medal. The Royal Society of Victoria established a Howitt Medal in his honour.

Professor Sir Baldwin Spencer concluded his obituary of Howitt with these words, "To the public of Victoria he was known as the man who rescued the remnant of the Burke and Wills Expedition, but to those who had the privilege of knowing him personally this was merely an episode in the life of a man of simple and noble character, whose one aim was a ceaseless and tireless search for truth."

Howitt contributed six papers to the *Victorian Naturalist*. The first was in October 1885 on a glassy selvage of basalt (tachylite) and gold-bearing

Alfred William Howitt is popularly remembered as the supreme bushman who, in 1861, quietly rescued the remnants of Burke and Wills Expedition, but he was world-renowned in scientific circles for his excellent work on geology, botany and anthropology. He was a member of the early FNCV. Photo: National Library of Australia, Canberra

sediments from the Tanjil Deep Leads Gold Mining Company. His clear observation and thorough work shows through. He cut a thin section of the basalt (which would have to be done by hand) for microscopic examination, and carried out a chemical analysis. Although working in an isolated Gippsland town of the pioneering days, his work was immaculate.

T. S. Hall — biologist, geologist and palaeontologist

It is characteristic of the times that scientific people were proficient in a number of disciplines. It is said that when Charles Darwin set off on the voyage of the *Beagle* he knew most of what was known then about the natural sciences. Hall's day was intermediate between that and the present when one person can be an expert in only one section of one discipline.

In 1980 Dr T. S. Hall wrote his first article for the *Naturalist*; it described the geology of the Moonee Ponds district. He recorded fossil "arca trapesium" (= *Anadara trapezia*) from Batman's Swamp (= West Melbourne Swamp) and commented that this species "now rare where they were then plentiful". Dr Pritchard told me that before the Coode Canal was built he used to collect *Anadara* at the mouth of the Yarra River.

Anadara does not exist in Hobson's Bay now. However, 6000 years ago when the sea was slightly warmer and higher it existed in immense numbers and grew to a much larger size than found in Hobson's Bay since European settlement. One Saturday afternoon in January 1950 I took my children to where the Appleton Dock was being excavated, and in a short time we collected 2000 *Anadara* for biometric studies.

Dr Hall also mentions Tertiary fossil localities in road cuttings. I used to collect there too, but they are all now built over. Later he wrote on the glacial beds at Heathcote, and musical sands. Altogether he contributed 40 articles to the *Naturalist*.

Hall (1858-1915) was born in Geelong and was educated at Geelong Grammar and the University of Melbourne. He was Director of the Castlemaine School of Mines 1890-1893, then became a lecturer at the University of Melbourne. His book "Victorian Hill and Dale" still makes interesting reading. He was President of the FNCV from 1901-1903. A full account of his life can be found in the T. S. Hall Memorial Lecture published in the *Victorian Naturalist* 10 years ago (Gill 1970).

Field Excursions

Excursions were an important part of the life of the Club in those early years. People then worked on Saturdays until noon, but (for example) would catch the 12.15 steam train for St Albans "a solitary hamlet on the Keilor Plains" then walk via Green Gully (where fossils were collected) and Keilor to Essendon, where a train was caught back to the city. I have seen a photograph of such a group, the men in their heavy suits and the women in their long frocks and large hats.

Of course it was very progressive to allow the women to attend excursions. I was present at the Centenary of the Field Naturalists' Clubs of Tasmania, and a scene from the early life of the club was re-enacted where a fiery controversy took place as to whether women should be allowed on excursions. In the play presented at the Centenary, the chief opponent of the idea finally slammed his fist on the table and said, "The place of women is in the home! I'm going home."

Another excursion was to take the steam train to Brighton Beach, then walk via Smith's Paddock to Hampton and Sandringham. From Sandringham, walks were taken to Rickett's Point and Beaumaris. These places were then unspoiled and very beautiful. Similarly, Green Gully and Dry Creek (where the Keilor Cranium came from) were places of idyllic beauty when I first knew them. "How green was my valley!"

The Irish Professor

Professor Sir Frederick McCoy (1817-1899) was born in Dublin, and was educated there and at Cambridge University in medicine. He then became deeply interested in the life of the past — in fossils. In 1850 he was appointed to the Chair of Geology at Queens College, Belfast, and in 1854 became the foundation Professor of Natural Science at the University of Melbourne. The Chair of Natural Science embraced geology, palaeontology, mineralogy, zoology, comparative anatomy, botany and chemistry. His *Prodromus of the Palaeontology of Victoria* is an outstanding work of its time. He became Director of the National Museum in 1858, and was a member of the Royal Com-

mission on the Victorian Gold Fields. For a full account of his career see Pescott (1954).

McCoy was a foundation member of the FNCV and President for the first three years of its existence. One is impressed by the fact that so many of the leading scientists at the University, in Government Departments and other institutions took such an active part in the Field Naturalists Club.

A noted Palaeontologist

Fashions occur in science as in most life. When it became the fashion to specialize highly in science, a young graduate was heard to speak disparagingly of Frederick Chapman and his wide-ranging papers. Someone much more experienced turned and said, "He wrote some 700 papers, notes and newspaper articles. If at this point of time all that information were withdrawn, you would have very little data to create the stratigraphy in which you are so interested."

They were discussing Frederick Chapman (1864-1943) who was born in London and became a very keen member of the FNCV. He contributed 108 papers to the *Naturalist*, was a President of the Club, and led numerous excursions. He helped develop the Maranoa Gardens at Balwyn that specialize in the native flora of Australia. In 1902 he was appointed Palaeontologist at the National Museum of Victoria, and he had to do everything from determining fossils to erecting the exhibits.

The Mallee was opened for settlement when little was known of how to control that ecology. As a result Melbourne frequently suffered red rains in the summer that precipitated Mallee dust. Chapman collected samples on the roof of the Museum, and with H. J. Grayson of the Department of Geology at the University of Melbourne prepared a paper on the red rain that described the sediments, and organic materials such as diatoms that it contained. In 1927 he was appointed Commonwealth Palaeontologist, a post which he held until he retired in 1935 at the age of 70.

His son was the noted engineer W. D. Chapman. His father asked him, when leaving for the Second World War, to send him a fragment of the rock from wherever he was. Some sand arrived and as Fred Chapman saw its polish under the microscope he said, "He is in the Egyptian Desert". When a piece of limestone came he said, "He has reached The Escarpment".

When I first visited the Museum to do research in 1935, the Palaeontologist's Office was an area screened off the west end of the fossil gallery with show cases. Mr R. A. Keble was the Museum Palaeontologist then, and he had made a camera lucida out of the brass barrel of an old microscope so that he could draw graptolites. A curtain divided the middle of the office and he took me through to introduce me to Mr Chapman who was about to give up the position of Commonwealth Palaeontologist, and to Miss Irene Crespin who was to take his place. Mr Frank Cudmore often came in to study his Tertiary molluscs.

At that time, work on the Foraminifera was being developed with a view to oil search. Cudmore said he could do better with macro-fossils. At their request, Keble chose two samples of sediment from the Torquay cliffs. A competition was to take place between the micro-palaeontologists and Frank Cudmore to see who could tell which was the higher stratigraphically and which the lower. Cudmore won. This illustrates the great advances in our knowledge of Victorian fossils since that time.

T. S. Hart (1871-1960) was a lecturer in geology at the celebrated Ballarat School of Mines. He wrote 51 articles for the *Naturalist* on both geology and botany. There were specialists in the early decades of the club, but also many who studied nature in a broader way. It is only in the 20th century that the study

of the inter-relationships of Nature have been investigated in a scientific way, giving rise to the science of ecology. My copy of the Shorter Oxford Dictionary was published in 1934, but it does not contain the word "ecology"!

Honour Roll of Early Geologists

It is difficult to know who to include in an article of this limited length. Sir Albert E. Kitson (1868-1937) was born in India and worked in the geological survey of Victoria, then in Nigeria and the African Gold Coast. He was a geologist and mineralogist of note. Thirteen articles from his pen appear in the *Naturalist* covering many subjects. A cave at Buchan is named after him.

Dr J. T. Jutson in 1905 published a paper in the *Naturalist* on Mt Shadwell, a volcano in Western Victoria. He was a lawyer who loved geology, so he took a post with the Geological Survey of Western Australia. On the meagre pay of those days he found it very hard to manage, so came back to Victoria and returned to legal work.

Many others in varying degrees were connected with the early days of the Club, and stories could be written of the life and work of R. W. Armatage, W. Baragwanath, Rev A. W. Cresswell, D. J. Mahony, C. W. G. Officer, Dr G. B. Pritchard, G. Sweet and E. O. Thiele.

The Contribution of Early Geologists

Much could be written about the knowledge gained, as well as the inspiration and leadership given others in the search for knowledge and understanding. The obvious pleasure of the participants in their worthwhile activities is quite infectious. However, this article is a personal impression of the people (many of whom I knew) and the times — not an historical record (which would take years to prepare). Two impressions are outstanding:

1. The Thoroughness of their Papers. There is an element of good editing, of course, but it is mainly a function of a real effort to understand, and a lot of trouble to communicate well.

Let us take an example. Mr C. G. W. Officer (1892) wrote a paper on "Supposed Human Footprints at Warrnambool". He studied the formation carefully, measuring numerous dips in the bedding. Under the microscope he examined the composition of the stone, and he had a chemical analysis done. No whole marine shells were noted, but several species of land shells were discovered. He correctly compared this calcarenite with the dune sands being piled up on the coast. He quotes the findings of others.

The alleged human impressions were measured and their form analyzed. For comparison, Officer studied the contemporary impressions in sand of birds, bandicoots, rabbits and dogs, and in the ancient rocks the trails of emus.

Interpretation of the alleged human impressions is the most difficult work of all. Graham Officer appears to believe the impressions are those of an adult Aborigine and a child in skin cloaks sitting in the sand, but he is careful not to go beyond his evidence (as many did then), and called them "supposed human imprints". Nowadays we have isotopic evidence of age, and other sophisticated tests that can be applied, but the verdict is still "case not proved". In spite of being a century old, the paper is still worth reading.

2. The co-operation of Professionals and Non-Professionals. The question is often asked why University Professors and leaders of the Museum, Geological Survey and such, strongly supported the Club in those early days but not now. The reasons are naturally complex, and include the much higher demand of modern leadership positions. However, I should like to venture an opinion, even if many disagree, because I think it could be a basis of helpful discussion.

In the early days the Club and those Institutions had a common outlook. All were in hot pursuit of new species, new

kinds of rocks and minerals, and so on; it was a world of exploration with many great expeditions still being conducted to learn the wonders of our world. Nowadays the Club continues its interest in species and such, but with a strong interest also in conservation. The institutions on the other hand have greatly strengthened their academic competence by the use of sophisticated research equipment, and by a much more highly advanced theoretical background.

For a time, a strong emphasis on high specialization kept the two types of work far apart. Now the general interest is in ecosystems, and a drawing together of the two spheres of action could again be achieved because we need to synthesize precise knowledge of the natural world with concepts of how all the elements interact to produce the ecosystems we so far only dimly descry.

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Natural History Medallion continued by FNCV for forty years

The Natural History Medallion was instituted in 1939 by a private member, Mr J.K. Moir, and he met the cost of the die. The Medallion is awarded each year to a person in Australia who has made an outstanding contribution to natural history. The first person to receive the award was A. H. Chisholm in 1940.

For forty years the FNCV has continued the award and has organised the committees to make the yearly selection. Somehow there has always been somebody in the Club who could take on the job.

The Trust Fund. Along with the need of someone to handle the organisational side, has been the need to finance the award. The cost of each medallion has risen from less than $20 to more than $200. Fortunately a forward-looking Club Secretary, Mr Garnet Johnson, instituted the Medallion Trust Fund in 1976. The Fund is now growing apace with contributions from all over Australia, and we can look forward to the time when its income will be able to finance the award completely.

Natural History Medallion Trust Fund

The following donations have been received and we thank the donors:

Amount invested as at 31 March 1980	$1057.50
Launceston Field Naturalists Club	10.00
Portland Field Naturalists Club (2nd donation)	5.00
The Linnean Society of NSW	10.00
Society for Growing Australian Plants, Tasmanian Region	20.00
Royal Society of Victoria	20.00
Peninsula Field Naturalists Club (2nd donation)	20.00
Mrs Thelma Mann	10.00
Ringwood Field Naturalists Club (3rd donation)	20.00
Miss Ethel Dixon	100.00
Total April 1980	$1272.50

Botanists and the FNCV — the first 30 years

BY JEAN GALBRAITH*

"We ought to have a naturalists club" said Charles French when, as had become a custom, a group of young naturalists had gathered in his home at the Melbourne Botanic Gardens. The words fell like seed in fertile soil. First there was discussion, then an advertisement inviting other naturalists to meet and talk it over.

They met (far more than had been expected) on 6th May 1880 and that evening the Field Naturalists Club of Victoria had its beginning.

Charles French was on the Club's first committee and later President. He approached botany through work in a nursery, then as propagator in the Botanic Gardens under Baron von Mueller. He later become custodian of the Botanic Museum until appointed Government Entomologist in 1889. When the FNCV was founded in 1880 it was as a botanist that he read one of the first papers prepared for the Club. It was on Victorian ferns in seven parts, discussing the genus, species, habitat and, usually, the cultivation of each fern. A series of papers on Victorian orchids followed in 1884, continuing until 1887.

French welcomed a suggestion by Baron von Mueller that he should spend his annual holiday collecting plants in the Wimmera, and his account of the trip reveals his enjoyment. He spent an earlier holiday similarly in Croajingolong. He and Sir Baldwin Spencer reported it. (*Vic.Nat.* 6, 1-38).

Charles French Jr began exhibiting collections of insects as soon as he joined the Club in 1882 when he was 14. After 13 years as herbarium assistant he was appointed assistant to his father, then became Government Entomologist after his father's retirement, and later biologist to the Agricultural Department. His interests were wide and botany had an important place in his life, increased during long and sometimes arduous field trips and short excursions.

Long after leaving the Herbarium he collected for it and, as his biographer E. E. Pescott recalls, "he travelled almost every portion of the colony, always making extensive collections for the Herbarium . . . entomological collections for his father" and "whatever he saw that might interest some specialist, he put into his bag, making his friends very happy". Crosbie Morrison commented "even after he had passed his 80th year he was a prodigious bush walker, yet even when he was moving at speeds which taxed younger men to keep up with him there was not a rare insect or inconspicuous orchid which escaped his searching eyes".

Frederick Pitcher was both a Club founder and a botanist. He too was at one stage herbarium assistant, and was later assistant curator of the Gardens. He had a wide knowledge of exotic plants but ferns were his special interest. He planned the fern gully at the Gardens and listed the Victorian ferns, many of which he had grown. He was director of the early wildflower shows and still busy helping at shows, quiet and courteous and helpful, in 1922.

F. G. A. Barnard, like the Frenches, added botany to entomology. He enjoyed his fellow members and benefited every one of them through his editorship

*Author of *Wildflowers of Victoria* 1950, *Collins Field Guide to Wild Flowers of South-east Australia* 1977, etc, etc.

of the *Victorian Naturalist* for 32 years (1892-1924) and was the originator of regular Club excursions. But his work on the *Naturalist* did not prevent him from being at different times, Secretary, Librarian and President. One service to botany was his paper *Are Popular Names to Native Plants Desirable?* From it grew the Plant Names Committee of which he was a member.

For nearly all his 50 years membership, Barnard held some office in the Club, and almost until his death he worked on an index to the *Naturalist* with H. B. Williamson. It was not completed when Williamson died soon afterward, and was not amongst his papers.

Just as a paper by Barnard resulted in the formation of the Plant Names Committee, so the urging of Dr Dobson, our second President, resulted in the writing of Baron von Mueller's *Key to the Plants of Victoria* published in 1888.

Baron von Mueller was such a giant amongst Australian botanists that one can no more than mention a few highlights. His achievements were almost incredible — as explorer, taxonomist, botanical writer, and inexhaustable supplier of specimens and notes for Bentham's *Flora Australiensis*. In spite of increased knowledge and changes in nomenclature the *Flora* remains invaluable.

The great plant collections of Melbourne Herbarium are based on Mueller's personal herbarium, and the plants of Victoria existed like a living map in his memory so that he was able to dictate descriptions of species in the *Key* to his assistant Charles French without reference to notes. Charles French remembered him not only as a very great botanist but "the kindest man who ever lived".

During his lifetime he published descriptions of new species almost continuously in *Southern Science Record* and *Victorian Naturalist* as well as other publications.

Baron Sir Ferdinand von Mueller with the regalia of some of the hundred-odd honours received from Europe and Britain for services to science. A giant in Australian botany, Mueller was among the original 54 members of the FNCV and wrote very many papers for the *Naturalist*. During the 1850s, 60s and 70s, he made many exploratory, plant-collecting trips, sometimes with others but often accompanied only by his horse and pack-horse. Photo: FNCV archives.

J. H. Maiden wrote "So great has been his influence on Australian botanical science that a catalogue raisonne of his works has become an imperative necessity". But no catalogue was prepared until 82 years after his death when the list by Churchill, Muir and Sinkora was published in *Muelleria* in July 1978. There was no biography of any length until *By their Fruits* by Margaret Willis appeared in 1949.

Johann Luehmann, also a founder of the Club, was the Baron's secretary, and later became Victoria's second Government Botanist. He published little, but did describe many species after von Mueller's death. He had great knowledge but said he was simply dealing with specimens which had been accumulated by his great predecessor.

He published a few papers during Mueller's lifetime including *Victorian Leguminosae* and *On the Eucalypts*.

Charles Walter was another botanist from Germany who assisted the Baron. He added many species to Victorian records, collecting especially in east Gippsland, the Alps and Grampians, and was the first collector of *Prostanthera walteri*, later named after him. He listed 700 species from the Grampians, saying there must be many more, but only about 50 have been added to his list.

Professor A. J. Ewart, whose membership dates from 1906, came from England in that year as Government Botanist and Professor of Botany at the University of Melbourne; he held both positions until 1920 when the professorship demanded all his time. In collaboration with J. R. Tovey, another herbarium assistant and a Club member since 1907, he published *Weeds, Poison Plants and Naturalised Aliens of Victoria*. With the assistance of H. B. Williamson who read the manuscript and wrote the section on Leguminosae, he prepared the *Flora of Victoria*. Published in 1930, it was the first Victorian flora since the Baron's *Key*.

Under Professor Ewart's presidency the Plant Names Committee of the FNCV was formed in 1907 and held monthly meetings for years. The Committee's history has been written by E. E. Pescott (*Vic.Nat.* April 1946). Its first period concluded with the publication in 1923 of *A Census of the Plants of Victoria with their regional distribution and vernacular names adopted by the Plant Names Committee of FNCV*. Each of the 12 members was given a leather-bound interleaved copy of the *Census* in appreciation of his work. I remember Mr Williamson saying amusedly, "We all went up to get our copies like schoolboys for their prizes".

H. B. Williamson, a member from 1900, was a dedicated worker on the Plant Names Committee and very active in the Club until his death in 1933. He not only shared the work of preparing the first *Census*, but personally revised the whole and brought it up to date for the second edition. His knowledge and clarity of expression were evident in his work for FNCV and in a series of informative papers, simple and accurate, illustrated by his own drawings of all species described. These included articles on *Ferns* (in four parts and the forerunner of our first fern book) *Lilies* (7 parts) and *Aquatic Plants* (4 parts). A

Herbert B Williamson contributed a series of valuable articles to the *Naturalist* on Ferns, Lilies and Aquatic plants, each species illustrated by his own drawings. He was a dedicated worker on the Plant Names Committee and prepared the 1928 revised edition of the *Census*. Photo: FNCV archives.

major work was his revision of the difficult genus *Pultenaea* (*Pc. Royal Soc.*)

He illustrated well the friendly helpfulness which I have always found in the Club. I met him at the wildflower show in 1922 and for the next ten years he identified plants for me almost every week and introduced me to Mueller's *Key*, which I slowly learned to use.

Dr C. S. Sutton was secretary of the Plant Names Committee and a close friend of Williamson's. His articles on *Cradle Mountain and its Flora (Vic. Nat.* Dec. 1916-Jan. 1917), Sandringham (May 1911) and Keilor (1916) are still valuable for reference and a pleasure to read.

T. S. Hart who joined FNCV in 1887 and remained a member until his death 73 years later, was a country member for much of his life. His work reflected his interests for he was both botanist and geologist. He taught geology at the Ballarat School of Mines, became the first principal of the Creswick School of Forestry, and later was principal of the Bairnsdale School of Mines. His geological papers were published elsewhere but our Club was fortunate in having a number of his botanical contributions, including papers on *Creswick Eucalypts* (Oct-Nov 1917) and the invaluable *Botanical Notes about Bairnsdale and the Eastern Lakes* (Oct 1923) which we still use for reference.

Dr Thomas S. Hall, who became a member of this Club a year after Mr Hart, wrote on several aspects of natural history. Palaeontology was his special interest but he was also deeply interested in Australian fauna and flora. He was President twice and had much to do with the reservation of Wilson's Promontory. He compiled a list of technical and scientific publications which must have been valuable to many beyond the Club, and did a service in emphasising the value of simple language. "Technical terms are necessary" he said, "but don't mistake the glib use of polysyllables for knowledge". As "Physicus" he contributed science notes to the *Argus* and *Australian* where he was a forerunner of later members Donald Macdonald (a member from 1903) and Crosbie Morrison (1918).

Charles Barrett, who was a member from 1899 until he died in 1959, gave invaluable service as a writer for the *Herald* and the *Sun*, and was editor of the *Naturalist* for 14 years. He gave more specific help to botany through the *Sun Nature Books* of which 666 000 were sold for sixpence each. One contained descriptions of 276 species of Australian orchids, and illustrations of 261 of them, 28 in colour, by W. H. Nicholls. It must have been the best botanical value ever sold for sixpence.

P. R. H. StJohn worked in a smaller field. One time head gardener in the Botanic Gardens, he became herbarium assistant and head classifier in the Botanic Museum. There his knowledge of eucalypts was readily shared. He was a member from 1908 and President 1929-30.

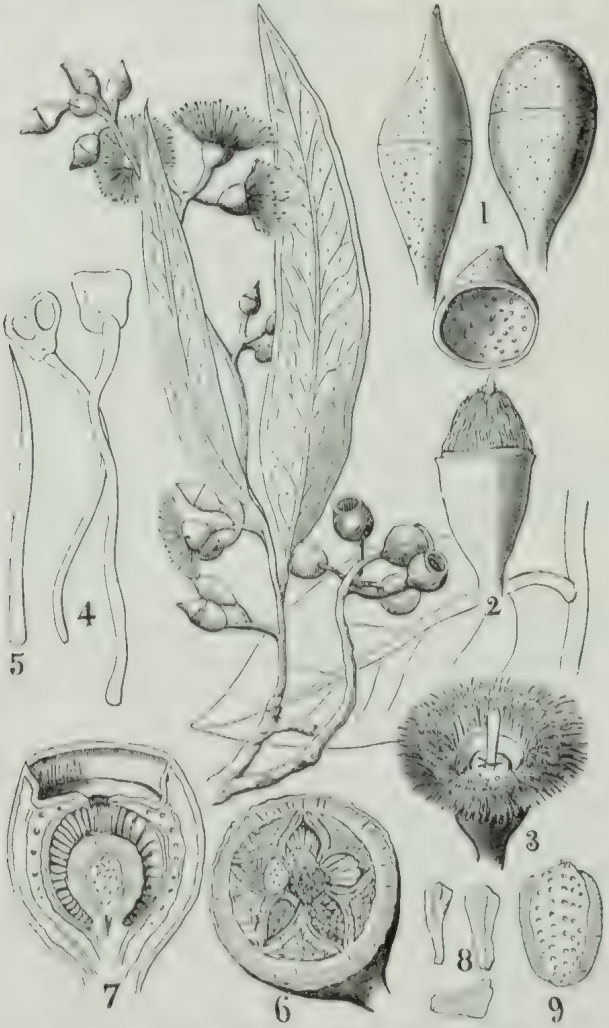
Gustav Weindorfer, who joined FNCV in 1901 when he arrived from Austria, was especially interested in alpine flora. He reported many alpine excursions and contributed papers on Victorian plants. It was not surprising that he later made his home amongst alpine plants near Cradle Mountain in Tasmania.

James Stirling was another lover of alpine flora whose membership goes back to the early days of the Club. He was a geologist and, as Lands Officer at Omeo, was within reach of mountain flowers. His *Remarks on the Flora of the Australian Alps* in three issues of the *Southern Science Record* for 1885, and *Mt Hotham Plants* in the *Victorian Naturalist* in 1887, as well as articles in the *Proceedings of the Royal Society* were a valuable basis for studies on our sub-alpine flora.

StEloy D'Alton, member from about

Eucalyptus melliodora.

Cunningham in Walpers Repertorium botanices systematicæ ii. 924 (1843)



A leaf of a very young plant, left unshaded; 1, calyx of two varieties; 2, unexpanded flower, the lid removed; 3, expanded flower; 4, front- and back-view of fertile stamens; 5, a sterile stamen; 6, fruit seen from above; 7, longitudinal section of fruit; 8, sterile seeds; 9, a fertile seed; 1–9, variously magnified; the main-figure of natural size.

One of the plates from volume 2 of Mueller's *Key to the System of Victorian Plants* 1885. Yellow Box has had no change of name.

1885, was a shire engineer in the Wimmera for more than 40 years from 1875 and sent hundreds of specimens, including undescribed species, to Baron von Mueller from the northern Grampians and Little Desert. (*Vic.Nat.* **30**, 65-78.)

Two explorers, both anthropologists and with wide natural history interests, must also be mentioned for their botanical achievements: **Baldwin Spencer** who took part in the strenuous Croajingalong trip, and **A. W. Howitt** whose planned *Gippsland Eucalypts* was

not written before his death. His notes and drawings accompanying specimens in Melbourne Herbarium show how fitted he was for the work.

A number of early botanists made special studies of mosses, lichens, algae and fungi.

D. Sullivan, a member from 1881 and a teacher at Moyston on the eastern edge of the Grampians, collected and studied mosses, writing *Mosses of Victoria with Brief Notes* in 1887. He was a capable botanist in other fields, writing ten papers on *Native Plants of the Grampians and their Vicinity* for volumes 2 and 3 of the *Southern Science Record*, a series on *Victorian Leguminosae*, and an article on *Droseras* in 1882.

F. M. Reader, a chemist in Dimboola and a member from 1884, was equally versatile. His private herbarium of flowering plants, mosses and lichens is now incorporated in Melbourne Herbarium and, as Dr Willis commented, "second only to Williamson's". He was an expert on grasses — not an easy thing to be.

R. A. Bastow, a member from about 1890, collected and named thousands of mosses and lichens which, with his collection of liverworts, have been incorporated in Melbourne Herbarium collections. He wrote the first paper on Victorian liverworts.

F. R. M. Wilson, another early member, was an able lichenologist and wrote many papers including *A Hunt for Lichens in East Gippsland* in 1889, followed by *A Description of 41 Lichens New to Science*. His collections are in the NSW Herbarium.

J. Bracebridge Wilson, a member from 1884 and headmaster of Geelong Grammar, worked on algae although he had a wide knowledge of general botany. He wrote many papers after joining FNCV, and his handbook of Geelong plants must have been of great value to those botanising there. One of his students wrote "to learn botany and geology from him was — even to boys — far more of a pleasure than a task".

Henry Watts, one of the founders, our first Librarian (1881-2) and later Vice-President, also studied algae and wrote his *Seaweeds of Victoria* during the first year of the Club's existence.

A. H. S. Lucas, first Editor of the *Naturalist*, was an early member with wide-ranging as well as specialist interests. In collaboration with Professor Dendy he wrote the first botanical text book based on Australian plants — and a very useful one it was. His *Part 1 of Seaweeds of South Australia* is almost as useful for Victorian shores as for S.A. "The Club has lost one of the most distinguished scientists ever connected with its history" wrote Charles Daley when Professor Lucas died.

Some students of fungi also belonged to the Club in its very early years.

Flora Campbell lived at Drouin and was, in the words of E. E. Pescott "an eminent student and collector of fungi". At a meeting in 1886 she exhibited 21 species until then unrecorded for Victoria. Her notes and drawings were sent to M. C. Cook and included in his handbook on fungi.

Hector Tisdall joined the Club in 1881. He was then a teacher in Walhalla and botanised on the Baws Baws and about north Gippsland, sending his specimens to Baron von Mueller. Later, at the Baron's suggestion, he concentrated on fungi. He studied them with enthusiasm, painting them and reading papers at many meetings. He was one of those invaluable members who are ready to help in any way — as committee members, leaders of excursions and helping with other clubs, adding to his own and others' knowledge.

Dr D. McAlpine, vegetable pathologist to the Government, joined the Club while Flora Campbell and Hector Tisdall were studying fungi in Gippsland. He was "undoubtedly the greatest figure in Victorian mycology,

publishing about 230 books, bulletins and phamplets . . . his masterpiece was the *Systematic Arrangement of Australian Fungi in tabular form* . . . the tabulation is still of use to mycologists and is not likely to be superseded" (J. H. Willis, *Vic.Nat.* Oct. 1940).

There were great botanists during the early days of the Club. The past has no monopoly of such members, but this is a record only of those who belonged to FNCV during its first 30 years.

It is a hundred years since Charles French and his friends formed the Field Naturalists Club of Victoria, yet we seem to be in touch with them still, not only through their work but because at least seven of us joined the Club while its founder was still active and knew him and others who were at the first meeting in 1880.

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Origin of the Field Naturalists Club of Victoria

Charles French and Dudley Best invited about 30 people to a meeting in a room at the Athenaeum on 6 May 1880. T P Lucas LLD presided and the meeting resolved to establish a provisional committee to draw up rules of management. The committee included the chairman and D Best, C French, J R Y Goldstein, Edward Howitt, W T Kendall and Henry Watts.

The meeting was resumed on 17 May and the Club formally established to admit members at 10/- per annum and managed by officers and a committee elected at that meeting. The following officers were elected: President Professor Frederick McCoy, Vice-Presidents Rev J J Halley and Dr T P Lucas, Secretary Mr D Best, Treasurer Mr E Howitt. The following committee members were elected: Messrs F A Forbes-Leith, C French, J R Y Goldstein, W T Kendall, J G Luehmann, J Wing. It was decided to hold an inaugural meeting next month.

At the inaugural meeting on 14 June 1880 at the Melbourne Town Hall, the proceedings of the May meeting were confirmed and new members enrolled.

At the following meeting on 12 July more new members were enrolled. At that date membership totalled 54, subsequently termed the "original members". They were: W Andrews, E Bage, J F Bailey, R Bain, W M Bale, F Barnard, F G A Barnard, E J Bartlett, J Bear, D Best, T H Bright, F C Christy, P Dattari, J E Dixon R L J Ellery, A Fletcher, T A Forbes-Leith, C French, T Gaunt, J R Y Goldstein, W Gordon, C Groener, J J Halley, A Harber, L Harris, T Harrison, E Howitt, T Husband, W T Kendall, D Kershaw, W Kershaw, T P Lucas, J C Luehmann, F McCoy, J N McKibbin, C Merton, F von Mueller, W Nicholas, A J North, F Pitcher, T Porter, T S Ralph, H K Rusden, O A Sayce, W Slater, T G Sloane, W Sloane, H Smith, C Walter, H Watts, J Williams, F J Williams, J Wing, F Wisewould. These names are recorded on a chart that had been compiled for the Club's 21st anniversary in 1901.

Zoology and the FNCV — the early years

BY BRIAN J SMITH*

Introduction

From the earliest days of exploration and later settlement European man marvelled at the strangeness and uniqueness of the animals on this "new" continent. The early descriptions of the kangaroo, koala, platypus and many others stimulated the enquiring minds of Britain and Europe to study the Australian fauna and by 1850 a great deal was known at least about the larger vertebrate animals.

In Victoria, the population had become large, rich and sophisticated, spurred on by gold, and had established learned and cultural institutions to provide the knowledge for expansion and feed the curiosities of leisure. The National Museum of Victoria, the Philosophical Institute and the Royal Society of Victoria were established in 1854, the University of Melbourne in 1855. These were wide-ranging in their scope and were largely dominated by the professional experts in the various fields. In the intellectual climate of the day an organisation was needed to bring together the professional and the interested amateur to further the study and conservation of the Australian flora and fauna. So the Field Naturalists Club of Victoria was founded in 1880.

From the outset the Club was a mixture of specialists and generalists, of dedicated researchers in a particular field of study and of those with a catholic interest content to gather observations and specimens for others to use. The observations and findings of the members were presented as papers or notes on exhibits at meetings or permanently recorded in the *Southern Science Record* and later the *Victorian Naturalist.*

The Generalists and Collectors

Throughout the Club's history there have been people who have made outstanding contributions in a number of major fields with no one topic taking precedence. These people are here termed **generalists,** not to belittle their contribution, but to note their wide field of endeavour and separate them from the **specialists.** Grouped with them are the outstanding field workers and collectors. These people were complete naturalists with a comprehensive knowledge of the bush. They brought to light many new observations and species but left the recording of these finds largely to others.

The first name which should be mentioned in this category is that of the first President of the Club, Professor Fredrick McCoy. First Director of the National Museum of Victoria and Professor of Natural Sciences at Melbourne University, McCoy was a major architect of the early shape of natural science in Victoria (Pescott 1954). Though not the initiator of the Club, he immediately saw its value and potential and threw his considerable professional weight behind the new body.

McCoy was a zoologist and palaeontologist of note with contributions in a wide range of fields. They include his *Prodromus of the Zoology of Victoria* (1878-90) and *Prodromus of the Palaeontology of Victoria* (1874-82). In these he published a large number of descriptions of new species including such animals as the Giant Gippsland Earthworm *Megascolides australis.* A highly controversial figure who clashed many times with authority and establish-

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ment and who, by such stances as his anti-Darwinism views, proved to be outside the mainstream of established science later in his life, he nevertheless laid a solid foundation both for the National Museum and the Club.

Two other people closely associated with the Club and the Museum during its early years were William Kershaw and his son James A. Kershaw (Pescott 1954). William Kershaw was appointed second taxidermist on the staff of the National Museum in 1864 and was mainly interested in insects. He made an extensive collection of Victorian insects but was known for his contributions and collections in many fields of zoology. He was an original member of the Club. He retired from the Museum in 1891 and was succeeded by his son James as taxidermist, and later Curator and finally Director of the Museum in 1929. James Kershaw was also primarily interested in entomology but was an excellent field collector and contributed to the whole field of zoology with many new finds and interesting records. He first served on the Council of the Club in 1898 and later held the offices of both Secretary and President.

Professor Sir Frederick McCoy (pictured here after receiving his knighthood in the 1890s) was FNCV President for the Club's first three years, 1880-83. He was a noted zoologist and palaeontologist who published a large number of new species descriptions. Photo: FNCV archives.

Another early member of the Club who must be mentioned as a generalist was A. H. S. Lucas MA. Lecturer in Biology at Melbourne University. He encouraged and guided several of the early members into proceeding with specialist studies, providing the knowledge and insight into particular finds and observations to enable these people to expand their own work. Lucas wrote on insects, frogs and many other topics, and carried out field excursions with Spencer, Frost and others. He served in several capacities on the Council of the Club including President from 1887-9 and first Editor of the *Naturalist* from its inception in 1884 to 1892.

A number of early members were best known as collectors over a wide field. One such collector was Joseph Gabriel who was interested in birds and their eggs, and in shells. He served on the Council for a number of years in the 1890's and recorded a great many interesting observations, particularly of the Bass Strait Islands. He was the father of C. J. Gabriel the later noted conchologist and FNCV member.

Two other people worthy of special note as collectors during the early years of the Club were A. W. Howitt and J. Bracebridge Wilson. Howitt travelled widely and wrote extensively on a wide range of plant and animal topics in Victoria. His main contribution was in the fields of botany and anthropology, but he undertook several important collecting trips with some of the early zoologists and was instrumental in obtaining many interesting collections of invertebrate animals; species of earthworms and flatworms have been named after him.

Bracebridge Wilson was headmaster of Geelong College in the 1880's. He carried out extensive dredging around the area of Port Phillip Heads acquiring large collections of sponges, hydroids and other marine life which he made available to a number of specialists to study and describe. Much of this work was carried out under the auspices of the Royal Society of Victoria as part of their Survey of Port Phillip Bay (Wilson 1895). However, several of the specialists who worked on this material were active members of the Club. This illustrates the close association of these bodies at this time and the ready acceptance of the contribution of members of the Club to the scientific studies of the day.

The Specialists

Amongst the early members of the Club were a number of people with a deep and dedicated interest in one or two specific groups of animals. Many of these people were amateur naturalists who approached their speciality from either a prior interest of collecting such objects as eggs, shells or butterflies, or from a background of amateur microscopy. These naturalists came into close association with professional biologists from the Museum, the University and various government authorities. This association, with the Club as the meeting-place, resulted in an amalgam of scientific objective methods with the dedicated enthusiasm of the amateur.

In this section it is intended to consider the outstanding specialists associated with the Club who made significant contributions to the knowledge of Victorian and Australian animals during this early period of the Club's existence. To do this the most convenient way is to follow the specialists' approach and divide them up according to the animal groups they studied.

Mammals. During this period there was no specialist mammalogist in Victoria. Several of the generalists, and in particular McCoy, described and observed mammals but the early descriptive phase of mammalogy was largely completed, while the later population, behavioural and detailed biological studies had not begun.

Leadbeaters Possum *Gymnobelideus leadbeateri* was figured in McCoy's *Prodromus of the Zoology of Victoria* 1878-90. The specific name honours Mr John Leadbeater of the National Museum. For fifty years it was feared that this mammal was extinct but, in April 1961, it was re-discovered by H E Wilkinson near Marysville. Photo: Fisheries & Wildlife Division.

Birds. Many of the early naturalists were interested in birds. Egg collecting was a popular study of some of the early naturalists and from this emerged the collecting of study skins, bird

photography following the introduction of dry plates in the 1880's, and the beginning of modern bird study with compilation of records and check-lists (McEvey 1975).

A. J. Campbell was an early active member of the Club, being on the Council several times in the first 20 years. He was an ardent egg collector and his knowledge of this subject culminated in the publication of the authoritative work *Nests and eggs of Australian Birds* (1900). He published many papers on birds in the *Southern Science Record* and *Victorian Naturalist* and was an early bird photographer, photographing Lesser Noddies in 1889. He initiated the first of several dinners which led to the formation in 1901 of the (Royal) Australasian Ornithologists Union. His extensive collection of eggs is now held in the National Museum.

D. LeSouef was another early ornithologist who first served on the FNCV Council in 1881 and published many bird notes in the *Victorian Naturalist*. His father was A. A. C. LeSouef, Director of the Zoological Gardens who built them up to be one of the finest in the world. D. LeSouef was also an egg collector but made many useful observations on the behaviour and biology of birds.

Herpetology. Little work was done on Victorian reptiles and amphibians in the period with the exception of contributions by C. Frost. In association with Lucas he carried out some specialist collections of frogs in Central Victoria, and the Baw Baw Frog *Philoria frosti* is named in his honour.

Fish. There was no specialist work being carried out on fish in Victoria during this period. Detailed work on the fish fauna was carried out in both South Australia and Tasmania on the southern ocean fauna at this time.

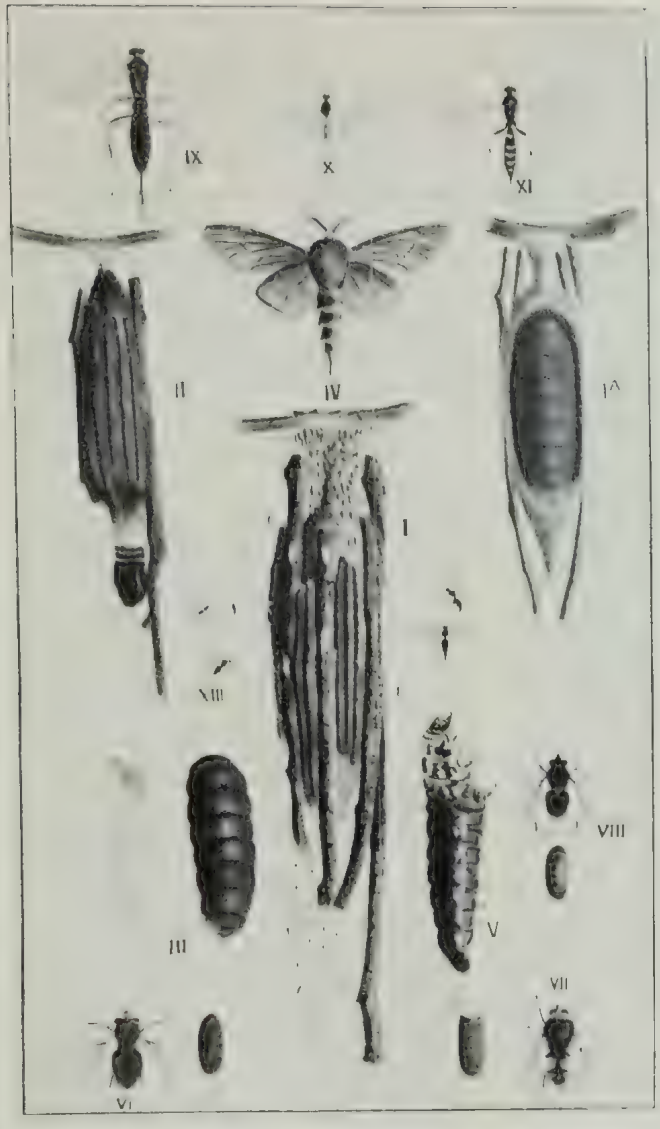
Insects. A great many of the early zoologists in the FNCV pursued the study of entomology (Musgrave 1932). Perhaps the most notable was Charles French Snr who was the instigator and founder of the FNCV and served in practically every capacity with the Club during its first 20 years of existence. He was Entomologist to the Victorian Government from 1889-1911 and published extensively on insects in the *Victorian Naturalist*. He did a great deal of work on destructive and economically important insect pests and published a *Handbook* on them in a number of parts between 1891 and 1911. Charles French Jnr followed in his father's footsteps and also made a significant contribution to Victorian entomology.

Other entomologists of note were W. Kershaw and F. G. A. Barnard. Barnard was editor of the *Victorian Naturalist* from 1893 to 1925 and published a great deal on Victorian insects. W. W. Froggatt, perhaps Australia's most prolific entomologist in terms of published contributions, was born in Bendigo, and worked on the fauna of Victoria throughout his life. However his major work was on the fauna of New Guinea, New South Wales and Queensland.

Two other early members of the Club who made significant contributions to Victorian entomology were E. Anderson and F. P. Spry. These two workers collaborated in several papers on Victorian lepidoptera and brought out the handbook, *Victorian Butterflies and How to Collect Them* (1893). Spry was entomologist at the National Museum from 1920-22.

Molluscs. Several important mollusc workers were early members of the Club. J. C. Cox, author of the first publication on Australian land shells, his 1868 *Monograph*, was an honorary member of the Club.

J. H. Gatliff was an early member and office bearer. He published the first checklist of Victorian marine molluscs in the *Naturalist* in two parts in 1887-8. Gatliff went on to collaborate with a fellow Club member G. B. Pritchard, Lecturer in the Working Mens College, on a nine part *Catalogue to the Marine*



Reproduction (reduced in size) from one of the 130 coloured plates in *Handbook of the Destructive Insects of Victoria* 1891-1911 by Charles French, initiator of FNCV. Most pests are introduced, but this shows the familiar Victorian lesser casemoth *Clania ignobilis* (Walker). The flies at top and bottom are parasites of the casemoth larvae. The coloured drawings were made by another early FNCV member — C C Brittlebank. Photo: National Museum.

Molluscs of Victoria. After the completion of the *Catalogue,* Gatliff collaborated with another club member, C. J. Gabriel, to set a solid foundation for the study of malacology in Victoria and to establish the basis of the fine Victorian collection held by the National Museum (Smith & Black 1969).

Terrestrial Invertebrates. The study of the terrestrial, non-insect invertebrates in Australia was virtually pioneered by two early members of the Club — W. Baldwin Spencer, Professor of Biology at the University of Melbourne and Arthur Dendy, Lecturer in the same department.

Dendy commenced his study of the terrestrial flatworms soon after his arrival in Australia in 1887 and wrote a series of authoritative papers on this unusual group of animals (Smith & Convey 1970). He was introduced to the Vic-

Arthur Dendy was an active participant in the early FNCV during his six years in Victoria. He was an authority on sponges and terrestial flatworms. In a *Naturalist* article he coined the term "cryptozoa" for small animals that hide under logs, etc. Photo: National Museum from *Records of a Family 1800-1933* by H McLachlan, Manchester University Press, 1935.

torian bush by FNCV members on Club excursions. In an important work he coined the term "cryptozoa" in the *Victorian Naturalist* (Dendy 1889) for that group of animals which inhabit deep shelter such as under logs and rocks. Dendy served on the FNCV Council during his six years in Victoria and was an active participant of meetings and excursions.

Baldwin Spencer also used the knowledge of Club members of the Victorian bush in his studies of terrestrial invertebrates and particularly earthworms. It is highly likely that both these scientists were encouraged to take up the study of the invertebrate fauna of the bush because of the influence of Club members during excursions. Spencer's series of papers on Victorian earthworms remained the standard works on the group until quite recently (Jensz & Smith 1969). Spencer was President of the Club from 1891-3 and 1895-7. He succeeded McCoy as Director of the National Museum in 1891-1929 (Pescott 1954), though over the later years he was mainly interested in anthropology.

Marine Invertebrates. Arthur Dendy again figures largely in the study of marine invertebrates during this period. Bracebridge Wilson was carrying out benthic sampling of the fauna of the Port Phillip Heads region and making these collections available to several specialists. Dendy's primary research interest was sponge taxonomy and during his six years in Victoria he published a series of authoritative papers on the sponge fauna (Smith *et al* — in press).

The hydroid fauna of this same collection was elucidated by one of the original members of the Club, W. M. Bale (Smith & Watson 1969). Bale had no formal biological training and was interested primarily in microscopy. His first few papers were published in the Journal of the Microscopical Society of Victoria and were on various microscopical techniques. However, leading from his utilization of marine organisms for his microscopical studies, arose a deep interest in the systematics of Hydroidea.

Bale quickly established himself as Australia's leading hydroid taxonomist publishing such works as his 198 page *Catalogue of the Australian Hydroid Zoophytes* (1884) and his *Report on the Hydroida collected in the Great Australian Bight and other localities* in three parts in the *F.I.S. Endeavour Reports* (1914, 1915). His major specialist library of hydroid books and reprints and his superbly made collection of over 1500 slides were donated to the National Museum. His work on hydroids is still the standard reference to the subject. Bale is the classical example of what a naturalist can achieve with original contributions to new knowledge if he perseveres with his interest and becomes a true specialist.

Other workers who also started out as microscopists and made an original con-

tribution to the study of Victorian hydroids were H. Watts, another original member of the Club, and R. E. Trebilcock. MacGillivray made a similar contribution to Bale in the study of bryozoa.

O. A. Sayce was another original member of the Club who approached the study of marine invertebrates from a background of microscopy. He served on the Council of the Club intermittently over the first 25 years and was President from 1903-5. His first field of study with the microscope was entomology, but he quickly turned his attention to crustacea and published a number of papers on marine and freshwater microcrustacea including descriptions of several new species (Anon 1911). His early death at the age of 49 undoubtedly deprived Australia of a fine worker in this field. His valuable collection was bequeathed to the National Museum.

The Later Years

Following these early years, the paths of the professional scientists and amateur naturalists studying zoology appeared to diverge even more. Many of the species had been described and most professional zoologists moved on to the study of behaviour, functional morphology and cell biology. The naturalist was left to continue to make observations of the biology of the animals and to continue to describe species in the smaller more neglected groups. This dichotomy intensified through the 40's, 50's and 60's with each side almost ignoring the activities of the other and belittling their contribution to the body of zoological knowledge.

Over the last ten years the wheel has gradually come full-circle with the new environmental awareness within the general community. Gradually more of the professionally trained zoologists are becoming aware of the importance of population and basic biological studies and discovering afresh the thrill of dealing with the whole animal. Modern scientific approaches are being used in the study of population dynamics and systems interactions, and a new cooperation is being born between the professional and the amateur. The Field Naturalists Club of Victoria and its journal the *Victorian Naturalist,* with its nearly 100 years of recorded data, are assuming a new importance in this cooperation; it will increase still further in importance as increased leisure and a higher level of academic attainment spreads through the community.

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Highlights of FNCV history

1880 6 May. Meeting of about 30 decided to form a natural history society.

1880 14 June. Inaugural meeting of FNCV with Prof McCoy as President.

1880 19 June. First Club field day — to Brighton.

1880 12 July. Second monthly meeting; more members enrolled to total 54 — the "original members".

1884 January. First issue of *The Victorian Naturalist.*

1884 November. First Club camp out — at Olinda Creek, Lilydale.

1885 January. Wilson's Promontory suggested as a national park.

1885 October. First Club Wildflower Exhibition — at the Royal Society's Hall.

1887 November. Expedition of 26 members to King Island. Given much publicity in the Melbourne *Argus*. See *Vic Nat* **4**: 129-64.

1889 January. Croajingolong expedition of five members which led to reservation at Cabbage Palm Creek. *Vic Nat* **6**: 1-38.

1889 June. First illustrations in *Victorian Naturalist* — to the Croajingolong report and are lithographs from sketches made by Spencer. *Vic Nat*: **6.**

1889 November. Upper Yarra Falls expedition. *Vic Nat* **7**: 157-78 with tipped-in photos.

1901 Twenty-first anniversary celebrated — membership 164.

1904 Wilson's Promontory Movement. See *Vic Nat* **21**: 129-31.

1906 Survey of Wilson's Promontory by six members. See *Vic Nat* **22**: 191-223.

1915 First Wildflower Exhibition to be held in the Melbourne Town Hall.

1921 Wyperfeld National Park reserved.

1923 First book published by FNCV: *A Census of the Plants of Victoria with their regional distribution and vernacular names adopted by the Plant Names Committee of FNCV.*

1927 Sperm Whale Head reserved.

1927 October. Western District expedition by five members — mostly south, west and north of Grampians. See *Vic Nat* **45**: 5-52.

1930 Fiftieth anniversary and 3-day Jubilee Natural History Show in July at St Kilda Town Hall. Membership 320.

1931 Wildflower Protection Act proclaimed, FNCV suggesting the first schedule of protected plants.

1934 July Special Koala issue of *Naturalist, Vic Nat* **51**: 58-80.

1934 Club publication of *Victorian Ferns.*

1934 Club Wildflower Exhibit in Fitzroy Gardens as part of Melbourne's Centenary celebrations.

1935 Von Mueller plaque erected at the National Herbarium; initiated by and partly paid by FNCV.

1935 Aboriginal rock paintings fenced in Grampians, FNCV sharing the costs.

1936 National Monuments and Parks movement inaugurated at a meeting at Herbarium.

1936 Club publication of *Victorian Sea Shells* by C J Gabriel and J K Allan.

1937 Areas reserved at Mallacoota, Cumberland and additions to Wyperfeld.

1940 May First award of the Natural History Medallion — to A H Chisholm.

1941 Club publication of *Victorian Toadstools and Mushrooms* by J H Willis.

1942 Reservation of Bell Rock, St Arnaud.

1944 FNCV receives bequest of wildflower paintings by Amy Fuller.

1944 Junior FNC established at Hawthorn.

1946 First study groups established — Geology, Botany, Photography.

1947 First lady president — Miss I Watson.

1948 M A Ingram Trust Fund created from estates of FNCV members John and Will Ingram. The Fund is to help with publication or other matters pertaining to mammals and birds.

1948 Glenelg River area reserved.

1949 First post-war National Parks and Monuments conference.

1950 Incorporation of FNCV and seventieth anniversary. Membership 576.

1952 Native Plants Preservation Society of Victoria formed by our Native Flora Preservation Group.

1952 National Parks Association formed.

1952 September. Special Lyrebird issue of *Naturalist. Vic Nat* **69**: 51-76.

1953 3-day Nature Show at Prahran City Hall.

1954 Prahan Junior FNC formed.

1954 Replanting of native flora section of Wattle Park undertaken by members.
1954 Microscopical Society of Victoria incorporated with FNCV.
1955 National Herbarium becomes official headquarters of the Club.
1955 Club publication of revised, enlarged fern book *Ferns of Victoria and Tasmania* by N A Wakefield.
1957 Members construct a nature trail at Colin Mackenzie Sanctuary.
1958 Club takes over distribution and sale of *Wildflowers of Victoria* by J Galbraith.
1958 Land near Maryborough given to FNCV by Mrs Nowlan as a wildlife sanctuary in memory of her parents Mr and Mrs W Cosstick.
1959 Public address system installed and 35mm projector purchased.
1960 Fauna Survey Group formed, (later known as Mammal Survey Group).
1962 Organ Pipes at Sydenham presented to the State by the family of Mr Green.
1962 Club microscope designed by Messrs W Woollard and D McInnes put into production for sale to members.
1964 Preston Junior FNC established.
1965 Publication (in association with — Lothian) of *Vegetation of Wyperfeld National Park* by J Ros Garnet.
1967 April Thousandth issue of *Victorian Naturalist*. 18 776 pages published since its inception in 1884.
1969 Publication of *Flowers and Plants of Victoria* in association with AH & AW Reed.
1969 Conservation Council of Victoria established.
1969 Montmorency Junior FNC established.
1972 Victorian Field Naturalist Clubs Association formed.
1973 Black Rock Junior FNC established.
1974 Land at Kinglake donated to FNCV from the estate of Harold Frahm.
1975 First annual working bee to eradicate bone-seed at Studley Park.
1975 Natural History Medallion Trust Fund established.
1976 *Victorian Naturalist* reduced to six issues per year.
1976 Publication of Author Index to the *Victorian Naturalist*.
1979 March. FNCV was host to the annual get-together of Field Naturalist Clubs Association of Victoria.
1979 Publication of Subject Index to the *Victorian Naturalist*.
1980 Centenary celebrated. Membership 922

FNCV Presidents 1880-1980

Prof Frederick McCoy, 1880-3
Hon Dr Dobson MA LLD FLS MLC, 1883-4
Rev J J Halley, 1884-7
A H Lucas MA, 1887-9
C A Topp MA, 1889-91
Prof Baldwin Spencer, 1891-3
H T Tisdall, 1893-5
Prof Baldwin Spencer, 1895-7
Charles French Sr FLS, 1897-9
J Shepherd, 1899-1901
Dr T S Hall MD, 1901-3
O A Sayce, 1903-5
F G A Barnard, 1905-7
G A Keartland, 1907-9
Prof A J Ewart, 1909-10
Frank Wisewould, 1910-12
Dr J A Leach DSC, 1912-13
J A Kershaw, 1913-15
Dr C S Sutton, 1915-16
F Pitcher, 1916-18
A D Hardy FLS, 1918-20
Joseph Gabriel, 1920-1
F Chapman ALS, 1921-2
Charles Daley BA FLS, 1922-24
J Searle, 1924-5
George Coghill, 1925-6
E E Pescott FLS, 1926-8
F E Wilson FES, 1928-9
P H StJohn, 1929-30
Charles Barrett CMZS, 1930-1
J A Kershaw FES, 1931-3
V H Miller, 1933-4
A S Kenyon MIE, 1934-5
G N Hyam, 1935-6
S R Mitchell, 1936-7
A H Chisholm CFAOU, 1937-8
R H Croll, 1938-9
A S Chalk, 1939-40
L W Cooper, 1940-1
P Crosbie Morrison MSC 1941-3
P F Morris, 1934-4
I C Hammet, 1944-5
H C E Stewart, 1945-6
F S Colliver, 1946-7
Miss Ina Watson, 1947-8
J Ros Garnet, 1948-9
C E Lewis, 1949-50
E E Lord, 1950-2
Dr Margaret Chattaway DSC, 1952-3
Alfred A Baker, 1953-4
Tarlton Rayment FRZS, 1954-6
Arthur J Swaby, 1956-7
J Ros Garnet, 1957-9
Dan E McInnes, 1959-62
Maurice K Houghton, 1962-7
W L Williams, 1967
Eric R Allan, 1967-70
Thomas Sault, 1970-3
Peter Kelly, 1973-6
Mrs Margaret Corrick, 1976-8
Dr Brian Smith PHD, 1978-

National Parks and the FNCV

BY J ROS GARNET*

While pursuing its main objective of observing and recording the natural history of Victoria, the FNCV has developed a tradition of deep interest in the conservation of nature and an attachment to the national park concept.

Of the thousands of men and women who have joined its ranks, the energy and enthusiasm of its leading members have ensured the Club's survival for a century. It is to the memory of such people that this article attempts to pay tribute. It is they who have established the base on which has been built our present knowledge of the natural history of our land.

Wilson's Promontory

In the Christmas vacation of 1884-5 occurred the event which the Club has come to recognise as its first experience in campaigning for the reservation of part of the State as a future study ground for biologists and naturalists.

Two FNCV members, A. H. S. Lucas MA BSC. a recent arrival from England with a friend recently graduated at the University of Melbourne J. B. Gregory LLB. and a third man A. Robinson, undertook a walking tour from Trafalgar to the lighthouse at the southernmost tip of Wilson's Promontory. An account was published in volume 2 of the *Naturalist* where Gregory asserted that the Promontory should be dedicated as a national park. The suggestion aroused a deal of interest at the time but it seems that the interest soon waned. However, from various sources of information, it can be assumed that the two friends continued to promote the idea.

Mrs Gordon Baillie's scheme to settle 1000 indigent crofters from the Isle of Skye on the Promontory was hotly debated in the newspapers of 1887 but it was not mentioned in the *Naturalist*. Of those who took part in the public debate, the only identifiable Club member was one who signed himself "G" — surely Gregory.

Eighteen months later, during his term of office as President of the FNCV, Lucas again brought the subject to the Club's attention and it was agreed that he and Gregory should seek the co-operation of other organisations in an attempt to further their original proposal. Within a few months several of Melbourne's scientific and cultural societies had responded. Then, as now, members of the FNCV were simultaneously members of one or more of those organisations and thus such influence as the Club exerted on public opinion was shared by its co-operating contemporaries. They were identified as the Royal Society of Victoria, the Trustees of the National Museum and of the Exhibition, Zoological and Acclimatisation Society, Victorian branch of Royal Australian Geographical Society, Piscatorial Council, Ornithologists' Union, Australian Natives Association as well as the Municipal Association, Trades Hall Council, Beefsteak Club, Black Rock and Sandringham Progress Association.

In various combinations all these organisations took part in the succession of campaigns which aroused the Victorian public to an understanding of the need for dedicating Wilson's Promontory as a national park. The *Age, Argus, Herald* and their weekly publications the *Leader, Australasian* and *Weekly Times*

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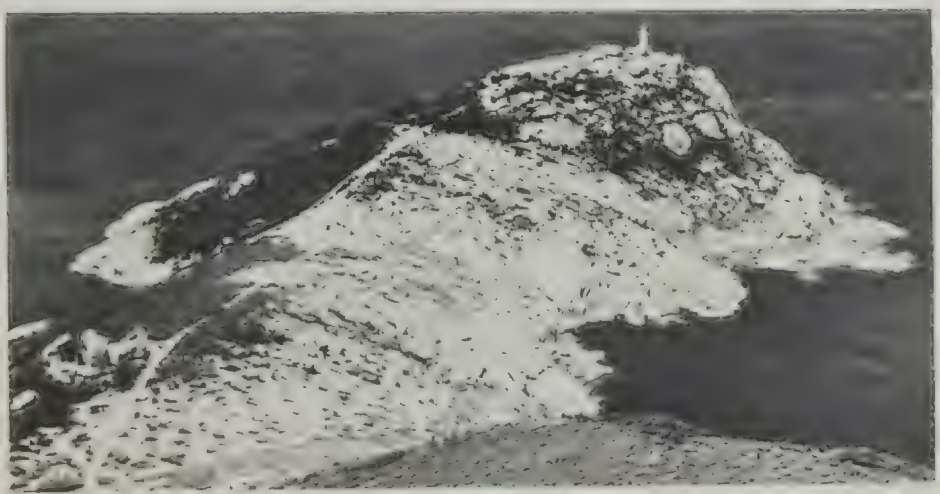
all helped to further the movement.

In those days civic leaders and politicians were not afraid to associate themselves with such campaigns. Frank Madden, Speaker of the Legislative Assembly and member of FNCV, threw himself into the fray and, with fellow Club members such as Professor Baldwin Spencer, Dr T. S. Hall, Dudley LeSouef, F. G. A. Barnard, F. Wisewould and A. G. Proudfoot, forced the issue on the government of the day.

The FNCV strengthened the hands of the campaigners by organising and conducting the first really systematic biological survey of the Promontory during the summer vacation of 1905-6. In that year the Club's committee included T. S. Hall MA, A. D. Hardy FLS FRMS, J. A. Kershaw FES, Dudley LeSouef CMZS and G. A. Keartland — all keen advocates of the Gregory-Lucas proposal. The survey was undertaken by Mr and Mrs Hardy, Messrs Hall, Kershaw, LeSouef and J. A. Leach along with co-opted specialists such as G. B. Pritchard (geologist and malacologist), A. S. Kenyon (ethnologist) and G. R. Macey (a photographer of some note). The results of the survey were published in the *Naturalist* of April 1906.

The movement was crowned with success. But the actual dedication of the Promontory as a national park did not eventuate until August 1908, almost a quarter of a century after Lucas and Gregory had first promoted the idea.

Coinciding with the gazettal of Wilson's Promontory as a national park came the announcement of appointment of the panel of citizens who were to serve the State as an honorary committee of management. Of the eleven people on the committee, six were members of FNCV although only one, Professor A. J. Ewart, was recognised as the Club's official representative. The others had been nominated by the several co-operating organisations — Australian Natives Association, Geographical Society, Ornithologists Union, Piscatorial Council, National Museum, Royal Society, and Zoological and Acclimatisation Society. The committee included three nominees who represented respectively the Lands Department, Mines Department, and the Ports and Harbours Branch of the Customs Department. Although J. A. Kershaw



Wilson's Promontory lighthouse near the southern tip of the Australian mainland. Its construction was completed in 1859. A walking tour to the lighthouse was a treasured memory for many of those who visited the Promontory in years gone by. Reservation of the Promontory was first proposed by two FNCV members in 1885 but it was not until 1908, after strenuous campaigning, that it was finally gazetted as a National Park. Photo: Algona.

had been one of the most active participants in the national park movement, he failed to gain a place on the committee as a voting member. However, he became its honorary secretary, a post he held for the ensuing 48 years until his death in 1946.

Several other national parks and nature reserves had been established in those early years but there is no mention of them in the Club's journal. For example, Mount Buffalo was temporarily reserved as a national park in 1908. The appointment of its committee of management was gazetted at about the same time as that of the Promontory. The Club played no part in its establishment. Nature conservation areas were reserved at Wyperfeld, Wingan Inlet, Mallacoota and Tarra Valley, all in 1909. Bulga Park had been reserved in 1904, Werribee Gorge in 1907, and Tower Hill (by Act of Parliament) in 1892, but none of them was reported in the *Naturalist*. In fact, as an organisation, the FNCV seemed to restrict its campaigning efforts to the Park best known to its members. However, several of the members had benefitted from the experience of co-operating with people of like mind in other organisations and they determined to continue the co-operation.

First National Parks Association

The result was the founding of a National Parks Association in December 1908. As might have been expected, most of the officers and committee men were members of the FNCV although only two, J. A. Kershaw and F. G. A. Barnard, actually represented the Club.

At the time, Kershaw was the Club's secretary and Barnard editor of the *Naturalist*. Nevertheless, the formation of the new body was not mentioned in the Club's journal until May 1909 when a small paragraph referred to its origin. In the following issue Kershaw made brief reference to his attendance at a deputation to the Premier by the Association, and in the annual report for the year 1908-9 it was revealed that it was the Beefsteak Club that had initiated the whole business!

The Honorable Sir John Madden MLA, Chairman of the meeting at which the Association was formed, apparently felt it necessary to explain how the Beefsteak Club came to be so intimately involved in the National Park movement. He pointed out that "its members are really self-denying gentlemen who love the romantic, picturesque and all in nature that helps those attractions, and their beefsteak propensities are stimulated by that simplicity only which cares little how the stomach dines so long as the mind and fancy are abundantly fed"!

The National Parks Association was an effective force while it lasted. By its exertions those several nature conservation reserves mentioned above were gazetted. In addition, Buchan Caves Reserve was established in 1916.

Leaders of the Association's activities included the noted Melbourne ophthalmologist Dr James Barrett MD FRCS who was eventually knighted for his outstanding services to the community. Although either president or chairman of almost every cultural and scientific organisation one could think of, he managed to find time to serve for some years as Chairman of the committee of management of Wyperfeld National Park. Somehow, he never did join the FNCV although he had great influence in the Club.

After World War I

World War I caused the National Parks Association to go into recess. However, when peace was restored, it resumed its operations but this time as a section of the Town and Country Planning Association. Through its efforts the State gained Lind Park in 1926, Spermwhale Head in 1927, and Kinglake in 1928.

The years of the economic depression brought about the demise of the

Association and a suspension of activity of many other cultural bodies but, fortunately, the FNCV survived. It began to assume the mantle of the conservation stalwarts of the past. Professor Ewart, Spencer's successor as chairman of the Wilson's Promontory committee, died 1937, by which time the only surviving member of the original committee was Arthur Mattingley.

A. H. E. Mattingley CMZS joined the FNCV in 1895. During the ensuing 55 years he occupied an almost unique place in those affairs of the Club which concerned national parks and nature conservation. He was a member of the National Parks Association from its inception in 1908 and, as well, a member of the committee of management of both Wilson's Promontory and Wyperfeld National Parks. With his death in 1950 passed one of the most enthusiastic and active workers for national parks in Victoria.

During the years that followed the gazettal of Wilson's Promontory there was a succession of FNCV members who took great interest in the national park concept. As well as those already mentioned, one brings to mind Charles Daley, F. Pitcher, H. P. R. StJohn, Charles Barrett, Vic Miller, George Hyam, Stan Mitchell, C. S. Sutton, Ed Pescott, Alex Chisholm, Hugh Stewart and Crosbie Morrison — all of them prominent in that field between the years 1908 and 1948.

During the 1930s, every one of the Club presidents was associated directly with the park movement. That probably accounts for the birth of a special sub-committee to carry on from where the old National Parks Association had left off. As in the past, this sub-committee established rapport with other societies known to be concerned about the conservation of nature. World War II intervened before it could achieve much.

After World War II

In the era of reconstruction that followed the war, nature conservation became an important theme in the affairs of FNCV and its associates. Once again the Promontory assumed a prominent place in the minds of Club members. Its occupation during the war by the armed forces caused so much public disquiet as to prompt the Club to re-establish its sub-committee to examine and report on the condition of the National Park. Its members were S. R. Mitchell and G. N. Hyam (both members of the pre-war sub-committee), Ron Kershaw, Colin Lewis and Ros Garnet. This team began to operate as the Club's National Parks and National Monuments committee and continued to do so until 1952 when its functions were taken over by a new National Parks Association.

During its several years of activity, the FNCV sub-committee undertook a thorough survey of the circumstances and conditions of all the State's major nature conservation areas. Its report, published and widely distributed in June 1948, re-awakened public interest in the whole problem of control, maintenance and management of our national parks. Stemming from it was a series of public conferences which endorsed the sub-committee's recommendations and ensured that they were put into effect through political action.

There followed deputations to premiers, a long enquiry by a Parliamentary State Development Committee, adoption by that Committee of the major recommendations of the FNCV report (which was complemented by a much more elaborate printed report in similar vein by the Town and Country Planning Association), and the introduction into Parliament of the long-sought National Parks legislation. This first Bill lapsed with a change of government. Then followed another deputation to a new Premier (Henry Bolte), the drafting of a fresh National Parks bill and, in 1956, its successful passage through parliament.

At last, Victoria had achieved a means of ensuring adequate control and management of its national parks through a National Parks Authority. The first Director was Phillip Crosbie Morrison. He was once Secretary and twice President of the FNCV and, at the time of his appointment to the new office, President of the Victorian National Parks Association.

Detailed accounts of the activities of the Club's standing committee on National Parks and Monuments are provided in its five reports printed in the *Naturalist* during the years 1946 to 1952.

In the years that followed, the Club continued to publish contributions that helped to maintain the post-war stimulus and its influence in matters concerning nature conservation. A glance at the *Naturalist Subject Index* for the years 1884 to 1978 shows that 75% of the articles on national parks and related subjects were published since 1950. That may be taken as evidence that the members of the Club were, by then, far more alive to the continuing problem of nature conservation in Victoria. More of its members than ever before knew their State from one end to the other. They had observed for themselves the sometimes devastating changes that had occurred in an environment once thought to be safe from "developers", and they knew that a large proportion of the community shared their concern about such changes.

Although there are now many voluntary organisations devoted to one or another of the diverse aspects of conservation, it is safe to say that the Field Naturalists Club of Victoria will remain a bulwark. With its vast resource of documented knowledge of the natural history of the State, its near-century old journal, and the competence and dedication of so many of its members, the FNCV will surely continue to exert the influence it has always had in shaping events and in helping to mould public opinion to the idea that nature conservation is still a practicable policy.

Phillip Crosbie Morrison, sometime President of FNCV, Royal Society of Victoria, and Victorian National Parks Association, became Victoria's first Director of National Parks and Chairman of the National Parks Authority at its establishment in 1956. His untimely death in March 1958 robbed Victoria of a dedicated worker for conservation and for the popularisation of natural history activities.

Happily, there are now almost enough National Parks, State Parks and Regional Parks together with Forest Parks, Fauna Reserves, Wildlife Reserves and Wildflower Sanctuaries to satisfy the requirement that, where at all possible, each recognizable and substantial ecosystem will be withheld from alienation.

Have you paid your subscription for 1980?

If not, please save the need of reminders and **post now** to FNCV Subscription Secretary, National Herbarium, The Domain, South Yarra, 3141.

Reports of recent Club activities

General Meeting
Monday 14 April

Members stood for a minute's silence in respect for Miss Jessica Annear who died suddenly on Easter Thursday. Our sympathy goes to her sister Miss Joyce Annear.

Honorary Membership. Honorary Membership was conferred *in absentia* on Mr T.R.N. Lothian. Mr Lothian, now Director of the Adelaide Botanic Gardens, has been a member of this Club for more than forty years. The certificate will be posted to him.

Speaker for the evening was Dr B.R. Wilson, Director of the National Museum. Dr Wilson first spoke of the impact of scubagear in enabling scientists to observe marine life *in situ* instead of relying on dredgings as previously. And the gear opened up a new field for photography. The speaker then showed fine underwater shots of colourful fish, sponges, corals and other creatures, giving us something about the way of life of each. The photographs were taken by Dr Wilson off the southern coast of Western Australia.

Exhibits. Showing the crystal formation were specimens of quartz porphory dyke(?) that had been found among basalt rocks at Phillip Island. Two foliage specimens were exhibited, one a normal juvenile Blue Gum *E. St Johnii* and one that looked similar but the leaves had stalks instead of being stem-clasping, and it was asked if the latter was also Blue Gum. A bright yellow slime mould covering about 15cm x 10 cm (6" x 4"), rather spongy in texture, was reported as appearing every year where the office tea leaves are dumped. Spider, 1.5 cm (5/8") all jet black except for a tiny pale spot on upper surface near tail end, was reported as a frequent visitor to an upstairs flat in South Yarra although not seen in previous years; it is the White-tailed spider *Lampona cylindrata* and is said to relish silverfish.

Star exhibit was a young Eastern Pigmy Possum, head/body length about 4cm (1½") with a much longer curved tail, and large round dark eyes; it seemed quite happy in its spacious glass box and behaved exemplarily when displayed on its exhibitor's hand.

Library. Assistant Librarian displayed a few of the many journals that regularly enter FNCV Library and spoke of the work of Mrs Olive O'Hagan. Some years ago Mrs O'Hagan observed the chaos among the arriving journals and offered to take them over. After days of initial sorting, Mrs O'Hagan now gives some hours each week to recording and filing so the journals are easily located and available for borrowing.

New Subscription Secretary. The Treasurer introduced our new Subscription Secretary Miss Helen Malcom. Subscriptions should be sent to her c/o FNCV at the Herbarium address.

Centenary Picnic, 4 May
at 'Fernleigh' near Whittlesea

About 80 people attended including three from Bendigo, a few juniors, and Mr Ron Kershaw from Tasmania. Ron's grandfather and great grandfather were among the 54 original members of FNCV, and there has always been a Kershaw in the Club.

'Fernleigh' was formerly farming land but is now the property of Dr Alan Parkin; he is rehabilitating it and has planted hundreds of native trees and shrubs. His sister, Ruth, showed people

round the plantings while Alan spent the whole afternoon taking a series of parties to the waterfalls or to Mt Disappointment — tough going even for his 4-wheel drive.

Perfect autumn weather added to the day's enjoyment.

Centenary Meeting, 5 May at the State Film Centre

Many members gathered early in the foyer for a preliminary drink and to talk, but at about 7.50 pm we were asked to move in to the theatre.

Mr Peter Kelly functioned as master of ceremonies and asked us to stand when the Governor entered and until the official party was seated on the platform. Then he introduced our own FNCV President!

Dr Smith welcomed all present, especially representatives from country clubs and from Government departments, then asked the Governor to open the meeting.

Sir Winneke spoke briefly of this historic occasion, of some of the highlights during a hundred years, and wished the Club well for the future.

Mr Stan Colliver, who was FNCV President in 1946, provided informative and entertaining recollections of the 1930s and 40s. He spoke of some of the personalities of that time, and of incidents at meetings and excursions. We would have liked to hear more from him but time was limited.

President Dr Brian Smith at the Centenary Meeting. Photo: Michael Howes.

Principal speaker was Dr J. H. Willis, known to probably every member of the Club, not only for his renown as a botanist but also because of his delightful talks at meetings and his stimulating leadership at excursions. Dr Willis titled his address 'Saluting a century of achievement by the FNCV'. It is fully reported in this issue, page 93-106. He ended by projecting some slides of early notable members, of early and of later excursions.

In proposing a vote of thanks to the speaker, Miss Jean Galbraith said that Dr Willis had taken us through a hundred years, not of struggle for power, but of quiet people and their enjoyment of the natural world, of specialists and non-specialists sharing in a very fruitful way.

FNCV President Dr Brian Smith spoke briefly of the present activities and future hopes of the Club, stating that the *Naturalist* is the Club's most important single activity. He also showed slides, ending with his favourite subject — a Victorian snail.

Before closing the meeting Dr Smith thanked all members who had helped to make the evening run so smoothly.

We returned to the foyer for supper and more talking. There was much appreciation of the endless provisions and services of Club members Miss Joyce Annear and her co-workers. The evening was a great success, although the theatre was not full.

Special Study Trips

The first three Special Study Trips were quite a success. Attendance was good and made up of younger and more active people keen to observe and study. These are field trips for members who

want to learn more about other people's specialities.

In contrast to the General Excursions where there is often no leader and individual members follow the things that interest them most, each Special Trip has a leader and a particular subject for study. That does not mean that other aspects of natural history are ignored, but only that the chosen subject is studied in greater depth.

By the time this appears in print, there will have been Special Trips to study marine biology, reptiles, birds, and cryptozoic life. Subjects for future trips include mammals, botany and geology. Please bring notebooks, also field guides and relevant equipment if possible.

Mammal Survey Group Easter camp at Strathbogie

The usual trapping and spot-lighting practices were carried out and resulted in nine different species. The Group was particularly seeking those animals that are suspected to be present but not commonly caught, such as Tuan, Pigmy Possum, Dunnart. Pit traps and traps up trees were set for that purpose; attention was also given to bait type. No Tuans or Dunnarts were caught, but an Eastern Pigmy Possum was taken in a pit trap. The Group plans more work in the area and the pits will then be reopened. Similar plans are in hand for the Buxton area.

During the weekend, visitors were received from the nearby camp of Hawthorn Junior FNC and from Benalla FNC, all being most interested in the equipment and techniques.

The Group has a permit from the Fisheries and Wildlife Division for its activities. Data from these surveys are sent to the F&WD and to the National Museum.

Hawthorn Junior FNC Easter Camp at Strathbogie

As usual the Hawthorn Juniors Easter camp was a family affair with more than 80 campers including some FNCV members.

The most popular individual in the camp was a Sugar-glider. It had been brought in by a nearby farmer who, after cutting down a tree, found the creature in its nest. Wendy Clarke, of the Mammal Survey Group, cared for it during the weekend, and it was released on a suitable tree during the last evening.

Geology Group Excursion to Phillip Island on 13 April

The Group visited Smiths Beach and Berrys Beach to examine the lava flows of different periods. Interesting aspects were the basalt dykes intruding the other flows, also a quartz porphory dyke (?) showing the crystal formation.

Botany Group Excursions

Macedon area for Eucalypts, 22 March

Meeting at Woodend, leader Miss Pat Carolan took the Group about a mile out of the township where *Eucapyptus aggregata* is flourishing and regenerating; it is the only place in Victoria where this NSW species occurs. Moving up Macedon, other eucalypts were examined as we ascended.

Coranderrk plant survey, 26 April

This was one of the Group's periodic visits to check the plant list established some years ago at Coranderrk, south-east of the Healesville Sanctuary. Last time, accompanied by a fungus expert, the list was considerably extended in that field, but little was added this time, perhaps due to the dry season.

Marine Biology and Entomology Group

A subject of marine life or of insects usually dominates any particular meeting, but sometimes the time is shared fifty/fifty. In March the Group received a very informative and stimulating address on the "Evolution of Molluscs" by Dr Brian Smith. Members are looking forward to June and an address on the beetle genus

Paropsis by Mr Peter Kelly. For years Mr Kelly has been breeding and studying several species and revising the genus.

Microscopy Group

The Group continues its series of addresses on all aspects of microscopy. They contain helpful information for beginners although the speakers (and interjectors) necessarily go beyond a beginner's comprehension. Visitors would be more likely to come again if the meetings began at the time scheduled.

Centenary Nature Show in October

Now is the time to begin thinking about the Nature Show and planning how you can help.

For instance, will you be able to supply some native flowers from your garden? We'll need lots.

Have you anything suitable for the historical exhibit?

Have you any contacts with the press, radio or TV, with schools, libraries or other organisations where publicity could be obtained?

And many people will be needed to erect the exhibits.

FNCV Centenary T-Shirts

Centenary T-Shirts now available in a large range of colours and sizes; excellent quality; to be sold at Club meetings or by mail order. Adult sizes $4.95, Childrens' $3.95; postage 70c, two or more $1.00.
Mail order to FNCV T-Shirt Order, National Herbarium, The Domain, South Yarra, 3141. Please include colour preferences (three), size, money, and return address.

FNCV Centenary display at Latrobe Library

This display opened on 6 May and will continue to 29 June. It is in the Irving Benson Hall, off the foyer to the right, and contains items relevant to the history and activities of the FNCV. All members are urged to visit it.

The Effects of Introduced Animals and Plants in Australia

A Symposium. Sunday 27 July, 9.15am-4.00pm at Lecture Theatre AB100, Rusden State College, 662 Blackburn Road, Clayton.

Registration fee $10 includes a copy of proceedings, programme, abstracts, morning and afternoon tea. Lunch $7 optional extra. Pre-registration is essential: apply to Mr R. Wallis, Department of Environmental Studies, Rusden State College, Clayton, 3168.

Topics include specialist areas such as carp, trout, snails, boneseed, terrestial and aquatic weeds, a major paper on feral carnivores, and case study of exotic animals in a particular area. Speakers include scientists from Government and academic departments who are working in these fields.

Errata in March/April 1980, Vol 97, No 2

Page 53. The two short columns of type under the map should change position: the right hand column to be read first following page 52, then the left column.

Page 84. In the Statement of Income and Expenditure under Income column — "Profit on Book Sales $25", the figure should read $639.

Page 86. Last line of fourth paragraph "having seen a brush-tailed wallaby"; two words have been omitted and should read "having seen signs of . . ."

(Continued from page 90)

GROUP MEETINGS

All FNCV members are invited to attend any Group meetings, no extra charge.

At the National Herbarium, the Domain, South Yarra, at 8.00 p.m.

First Tuesday — Mammal Survey Group.

Tuesday, 1 July. Identification of pigmy possums.

Tuesday, 5 August. Potoroos and bandicoots.

First Wednesday — Geology Group.

Wednesday, 2 July. The solar system. Speaker: Dr A. Prentice.

Wednesday, 6 August. Geology of the Kimberleys, Western Australia. Speaker: Ian Robinson.

Third Wednesday — Microscopy Group.

Wednesday, 18 June. How to prepare slides and mount objects in Canadian balsam, glycerine jelly, cuparal and other mountants.

Wednesday, 16 July. Pond and marine microscopic life.

Wednesday, 20 August. Botanical section cutting, staining and mounting.

Second Thursday — Botany Group.

Thursday, 12 June, Fungi in Victoria. Speaker: Dr J. H. Willis.

Thursday, 10 July. Plant family Chenopodiaceae. Speaker: Miss L. White.

Diversity of plants in the southern Dandenongs. Speaker: Mrs H. Weatherhead.

Thursday, 14 August. Flora of the Grampians. Speaker: Mr I. Morrison.

At the Conference Room, the Museum, Melbourne, at 8.00 p.m. Good parking — enter from Latrobe St.

First Monday in the month — Marine Biology and Entomology Group.

Monday, 7 July. How to identify insect larvea. Speaker: Mr P. Carwardine.

Monday, 4 August. Natural history of some wasps. Speaker: Mrs Z. Lee.

GROUP EXCURSIONS

All FNCV members are invited to attend Group excursions.

Botany Group, last Saturday

Saturday, 28 June. Fungi at Kinglake.

Saturday, 26 July. Kalorama and Olinda.

Saturday, 30 August. Lysterfield area for wattles.

Day Group — third Thursday

Thursday, 19 June. Coburg Park Reserve, Murray Rd. Meet 11.30 a.m. North Coburg tram, no.19, along Elizabeth St. to stop 41 in Sydney Rd (at Murray Rd).

Leader: I. Gillespie. Phone 578 1879.

Thursday, 17 July. Ancient Times House, 116 Little Bourke St., Melbourne. Meet 1.30 p.m. Cost $1.00 per person for a group of 15. Leader: J. Annear. Phone 88 2803.

Thursday, 21 August. Cheltenham Park. Meet 11.30 a.m. Leader: A. Fairhall. Phone 578 2009.

Mammal Survey Group

Saturday, 14 — Monday, 16 June. Queen's Birthday weekend. Eildon camp.

Geology Group

Sunday, 6 July. Building stones of Melbourne. Leader: Mr G. Love. For details see under FNCV Excursions.

Sunday, 13 August. Hull Rd, Lilydale. Fossil location. Meet 10.45 a.m. in Hull Rd.

New Beauglehole plant survey available from Portland FNC

Beauglehole, A.C., 1980. **'The Distribution and Conservation of Vascular Plants in the Corangamite-Otway area, Victoria'.**

Available from Portland Field Naturalists Club, PO Box 470, Portland, Victoria 3305, for $5 a copy including postage.

This is a publication of 108 pages which includes an up-to-date checklist of the vascular flora of about 1332 species, showing the distribution of each species within the area and including many new records. The conservation status of each species is indicated and detailed distribution data are given for 475 rare species. The 146 native species absent from biological reserves are listed. The location of areas is given in which new reserves would significantly increase the number of plant species which are adequately conserved. A detailed, coloured map showing minor grid squares and the location of various types of Public Land is included.

The earlier publication, 'The Distribution and Conservation of Native Vascular Plants in the Victorian Mallee' is available from the same address for the same price.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

Patron:
His Excellency the Honorable SIR HENRY WINNEKE, KCMG, KCVO, OBE, KStJ, QC

Key Office-Bearers 1979-1980

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Bookings and keys: Mr. I. F. MORRISON, 788 Elgar Road, Doncaster (848 1194)

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

Subscription rates for 1980

Metropolitan	$12.00
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Junior	$2.50
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GENERAL MEETING

At the National Herbarium, the Domain, South Yarra.

Monday, 11 August 8.00 p.m.
Programme hosted by Mammal Survey Group.
Speaker: Mr Bob Warneke, Arthur Rylah Research Institute.
Subject: Forest mammals research units.

Monday, 8 September 8.00 p.m.
Speaker: Mr D. Saunders, Director of National Parks.

Monday, 13 October 8.00 p.m.
Wilsons Promontory study evening hosted by the Study Groups.

New Members — July/August General Meetings.

Ordinary
Mark Burns, 85 McKean St., North Fitzroy.
P. W. Baxter, 39 Glen Orme Ave., Ormond.
Vina Curnow, 10 Harcourt Ave., Caulfield.
David Haskins, 68a Shady Grove, Forest Hill.
Greg. Jacobs, 54 Tulip Cres., Boronia.
Michelle Keable, 18 Charles St., Kew.
P. Koziell, P.O. Box 6, Hampton.
Mrs Joan Palamountain, 20 Royal Cres., Camberwell.
Miss L. M. Potter, 1/249 Highfield Rd, Burwood.
Claude Tomisich, 83 Augustine Tce, Pascoe Vale South.
Chris. Townsend, 13 Parkstone Ave, Pascoe Vale South.
Lance Williams, 29 Erica Cres., Heathmonth.
Anthony Zidarich, 114 Tinning St., Brunswick.

Joint
R. F. & M. Chugg, 1/397 Mont Albert Rd., Mont Albert.
Mr Gordon & Mrs Sheila Clark, 58 Belmore Rd., Balwyn.
Mr Berry & Mrs Jan. Houghton-Allen, 25 Gellibrand St., Kew.
Mrs Bessie & Miss Elizabeth Wall, School Rd., Menzies Creek.

Country
Mr R. C. Fricke, 11 Ridge Rd., Blairgowrie.
David McIntyre, P.O. Box 129, Beechworth.

FNCV EXCURSIONS

Sunday, 6 July. Langwarrin, Mornington Peninsula. Leaders: Botany Group. The coach will leave Batman Avenue at 9.30 a.m. Fare $5.50. Bring one meal.

Sunday, 5 October. Bendigo — Whipstick. Leader: Mr F. Robbins. The coach will leave Batman Avenue at 9.30 a.m. Fare $7.00. Bring two meals.

Friday, 10 — Sunday, 12 October. Centenary Nature Show. Set up on Thursday evening, 9 October. Come along and bring your friends, help if you can. Details elsewhere in the Naturalist.

Preliminary notices:

Saturday, 1 — Saturday, 8 November. Wilson Promontory. A special week in our centenary year when all members are invited to join a combined outing to a National Park closely linked to the history of the FNCV. The National Parks Service is co-operating with us and there will be guided walks and talks on the natural history of the area. Check with Excursion Secretary about accommodation remaining, and please let her know if you intend camping. The deposit of $10.00 should already have been paid to the Excursion Secretary: balance is to be paid to National Parks Service on arrival. A coach has been chartered for the week. The cost will be approximately $35.00 per person and must be booked separately from the accommodation through the Excursion Secretary. Deposit $5.00. The coach will leave from Flinders St by the Gas and Fuel Corporation at 8.30 a.m. on Saturday, 1 November. Bring a picnic lunch. The balance of the coach fare should be paid by the October General Meeting.

Saturday 17 — Sunday, 24 January 1981. Mt Kosciusko. Please note correction of return date. The coach will leave Flinders St by the Gas and Fuel Corporation at 8.15 a.m. on Saturday, 17 January. The party will spend the first night at Orbost, 6 nights at Wilson's Valley, and one night at Corryong on the return journey. Accommodation, D.B.B. and coach fare will be $250.00. Deposit $20.00 should be paid to the Excursion Secretary on booking, but check first that there are vacancies.

SPECIAL STUDY TRIPS

Sunday, 7 August. Geology and Forest types compared with Buxton-Cathedral Range. Leader: M. Groom. Meet at 8.20 a.m. at Camberwell Station to arrange transport. Train leaves Flinders St at 8.06 a.m. Meet at 10.30 a.m. at the corner of Maroondah Highway and Cathedral Lane. Conclude approx. 4.30 p.m. Bring lunch, walking shoes and adequate clothing. Ring M. Groom if you require transport or can take a passenger, 874-8194 (BH).

Saturday, 20 — Sunday, 21 September. Botany of coastal heathlands, Angahook, near Anglesea. Leader: N. Walsh. Saturday — arrive at Anglesea 1.00 p.m. Investigate surrounding woodland. Sunday 10.30 a.m. — walk through Angahook Forest Park and investigate the flora. Those wishing to at-

(Continued on page 183)

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Editor: Robert L. Wallis
Assistant editor: F. Dane Panetta
Editorial committee: H. Cohn, R. Kent, B. Smith

Cover illustration: Female crimson-spotted rainbowfish.

The Crimson-spotted Rainbowfish, *Melanotaenia fluviatilis* (Castelnau 1878)

BY G. N. BACKHOUSE* AND D. J. FRUSHER#

Introduction

One of Victoria's smallest and most colourful freshwater fish, the crimson-spotted rainbowfish *Melanotaenia fluviatilis* (Castelnau 1878), belongs to the family Melanotaeniidae. Fishes of this family are found in Australia, New Guinea, Waigeu and Aru Island, usually in tropical watercourses where the maximum water temperature is 25-33° C and the pH is 7.2-7.8 (Allen 1978; Munro, 1967).

The crimson-spotted rainbowfish is an excellent aquarium fish; it is easy to keep and will spawn freely given favourable conditions.

In this paper we report the distribution of the two subspecies of *M. fluviatilis* and describe some aspects of the biology of the Victorian subspecies, especially spawning behaviour and early development.

Taxonomy

A surprising degree of speciation has occurred within the Melanotaeniidae, there being an estimated 30-40 species. Most of the species are found in New Guinea, where many are restricted to particular watersheds. Because of difficult access to native habitats the biology and taxonomy of the species have not been fully examined and are therefore poorly understood at this time.

In Australia there are three genera of melanotaeniids: *Quirichthys*, the blackmast or strawman; *Rhadinocentrus*, the soft-spined sunfishes; and *Melanotaenia*, the rainbowfishes. Until recently rainbowfishes from Australia were attributed to two genera, *Melanotaenia* and *Nematocentris*, but pending a complete revision of the family, Allen (1978) has recommended that *Nematocentris* be considered synonymous with *Melanotaenia*.

The taxonomy of the rainbowfishes has not been fully elucidated, and they display considerable geographic and individual variation in their colour pattern, body shape and meristic characteristics which makes final identification difficult.

Fig. 1. Male crimson-spotted rainbowfish, *Melanotaenia fluviatilis*. L.C.F. 78 mm. Broken Creek, Devenish.

Fig. 2. Female crimson-spotted rainbowfish, *M. fluviatilis*. L.C.F. 62 mm. Broken Creek, Devenish.

*Fisheries and Wildlife Division, Snobs Creek Freshwater Fisheries Research Station and Hatchery, Private Bag 20, Alexandra, Victoria 3714.
#Eastern Districts Aquarium Society Native Fishes Study Group, C/- Honorary Secretary, P.O. Box 502, Ringwood, Victoria 3134.

Fig. 3. Distribution of the crimson-spotted rainbowfish in south-eastern Australia.
A. *Melanotaenia fluviatilis fluviatilis*
B. *M.f. duboulayi*

At least 8 species of *Melanotaenia* are found in Australia, mainly in tropical regions. *M. fluviatilis* is widespread in the subtropical and temperate fresh waters of eastern Australia (Lake 1978). The species is the only rainbowfish found in Victoria and is restricted to the Murray River system.

Two subspecies of the crimson-spotted rainbowfish are recognized; *Melanotaenia fluviatilis fluviatilis* (Castelnau 1878), which is found in the inland Murray-Darling system in Queensland, New South Wales, Victoria and South Australia; and *M.f. duboulayi* (Castelnau 1878) which occurs in the coastal drainages of southern Queensland and northern New South Wales (Fig. 3).

Description of adult fish

The crimson-spotted rainbowfish has an elongate-oval laterally compressed body with convex dorsal and ventral profiles. Most of the head and body are covered with moderately large cycloid scales. There are two narrowly separated dorsal fins, the first much smaller than the second, and the caudal fin is moderately forked.

The fish's body is silvery and has a greenish iridescence. Its dorsal surface is olive-green to dusky brown; its ventral surface is lighter, almost white. Smaller specimens are translucent, and the peritoneum and vertebral column are clearly visible. The fins are colourless to pale yellow and often have black margins. The operculum bears a pink to crimson spot, from which the species derives its common name.

The shape and colour of a rainbowfish vary considerably with age, maturity, habitat and sex. Its body generally becomes deeper with age, while the dorsal and ventral profiles of the head become more concave. In older fish, especially males, the lower jaw often protrudes.

Sexual dimorphism of the species is marked, males being larger and more colourful than females. Males are also deeper bodied and develop a nuchal hump and an angulate breast profile as they grow. In mature males the posterior portions of the second dorsal and the anal fins are elongate and pointed, whereas in females they are short and rounded. In older male fish some rays of the first dorsal fin may extend into free filaments. During the spawning season, the male's colour intensifies considerably, the body becomes emerald green, the throat and pelvic fins orange, the caudal fin deep red and the dorsal and anal fins yellow with orange flecks and pronounced black margins. Females reach a length of about 70 mm (length to caudal fork: LCF) and males 90 mm (LCF).

Distribution and Habitat

In Victoria, *M.f. fluviatilis* is found only in the Murray River system, where it is uncommon and restricted to discreet areas over a wide range (Fig. 3). The species is more common in the northern parts of its range, and its distribution in Victoria is probably limited by low water temperatures.

The species inhabits billabongs, streams and the back-waters of large rivers. Waters where subsurface vegetation is abundant seem to be preferred, possibly because they provide lateral concealment from potential aquatic predators, as well as providing suitable foraging and spawning areas. Areas with surface vegetation appear to be avoided, perhaps because the species, is, to a large extent, a surface feeder.

Biology

Schools of crimson-spotted rainbowfish, often 30 or more individuals, may be seen swimming just below the water surface. Adults particularly are extremely wary and quickly seek shelter if disturbed. At night they rest, individually, just below the water surface.

Rainbowfish are essentially carnivorous; they feed on aquatic invertebrates associated with their weedy habitat, and on terrestrial arthropods that fall or alight on the water surface, but they will take some plant material such as filamentous algae.

In Victoria, the crimson-spotted rainbowfish has been recorded as spawning during October, November and December. In aquaria maintained at 20-25°C the species spawns readily throughout the year; in aquaria maintained below 20°C the species did not spawn. Specimens taken from the Goulburn River, just south of Nagambie (Victoria) in October 1977 were transferred to an aquarium set up with a sand substrate and thickly planted with aquatic plants. These fish spawned five days later.

Males have a spectacular courtship display. The colour of the body and fins intensified and both dorsal and anal fins were held fully spread, as the male rapidly darted throughout the aquatic plants. The male then swam towards the nearest female, and after swimming rapidly around the female several times, nudged her on the lower abdomen. If the female was not ready to spawn she swam away. If the female did not swim away, the male continued his courtship for a few minutes until the pair moved to a prospective spawning site among the plants. When the male moved up to lie close alongside the female, both fish trembled violently, and the female released a small cloud of up to 10 thread-bearing eggs, which sank slowly among the plants. The female spawned 3-4 times a day for several days, usually in the early morning but occasionally in the early evening, just before dark. Males became very aggressive during this period, attacking other males by ripping their fins, and relentlessly courted other females. Pairing lasted only for the spawning sequence, and males spawned with any female that was ready to spawn.

After spawning had proceeded for four days, the adults, who would otherwise eat the eggs, were removed from the aquarium. The water-hardened eggs were 1.3-1.8 mm in diameter. At a temperature of 24°C, the eggs hatched in about 7 days. Newly hatched larvae measured 2.5-3.1 mm in total length, and were well developed. Within a few hours of hatching, the larvae congregated just beneath the water surface and began feeding within a day. Initially they were fed on cultured planktonic protozoans, such as *Paramecium;* when 7-10 days old the larvae were 5-9 mm long, and large enough to accept newly hatched brine shrimp (*Artemia*) nauplii. They grew rapidly to 25 mm in 35 days. As individual growth rates varied the largest fry were removed to prevent cannibalism of smaller fish. Adult fish readily accepted a variety of live and commercially available fish foods.

Discussion

Since crimson-spotted rainbowfish reared in an aquarium maintained below 20°C did not spawn, water temperature may be an important factor governing the spawning and therefore the distribution of the species in Victoria. Beumer (1979) regarded increasing water temperatures, increasing day length, and, less important, rising water-levels and increasing turbidities as spawning stimuli for the East Queensland rainbowfish, *Melanotaenia (Nematocentris) splendida.*

In Victoria, rising water levels are not an essential prerequisite for crimson-spotted rainbowfish spawning, as evidenced by the fact they they will spawn in an aquarium with a constant water level. However, shallow floodwater may warm up rapidly, given appropriate conditions, and may stimulate spawning by crimson-spotted rainbowfish, as is the case with several other Murray-Darling River system fishes (Lake 1971, 1978).

Some aspects of the spawning of crimson-spotted rainbowfish have been reported previously (Blewett 1929 (as *Melanotaenia nigrans*); Lake 1971, 1978). The species spawns in a fashion similar to that reported for the family Melanotaeniidae (Breder and Rosen 1966). Sterba (1963) and Beumer (1979) record the spawning of McCullochs rainbowfish, *M. macculloch*i and the East Queensland rainbowfish, *M. splendida* respectively. We have observed the spawning of the chequered rainbowfish, *M. maculata,* the black-striped rainbowfish, *M. nigrans* and the western rainbowfish, *M. australia;* their spawning habits do not differ markedly from those we describe for *M. fluviatilis.*

Acknowledgements

The authors extend their thanks to Drs. J. P. Beumer and D. D. Evans (Fisheries and Wildlife Division, Victoria) for their constructive comments on the manuscript.

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Radiocarbon Date For The Colongulac Skeleton, Victoria, Australia

BY EDMUND D. GILL*

The Skeleton

When defining the Colongulac Loess in 1951, I made a close search for fossils. A terminal phalanx, a rat's tooth and a *Coxiella* shell were found. The phalanx was determined by Professor L. J. Ray as human. On excavating the site, a flexed Aboriginal skeleton (Nat. Mus. Vict. reg. no. X75979) was found, consisting of the long bones but with many of the small bones missing; the skull was absent but three teeth were present (Pl. 1, fig. 1). This was interpreted as a burial which later was temporarily bared so that the skull and a humerus were decayed or otherwise lost, and the small bones scattered (Gill 1953). The phalanx that was found first was a short distance from the rest of the skeleton. Other phalanges were found with the long bones. A complete list of the bones discovered is given in an appendix to the paper quoted above (p. 86). The site is shown in Gill 1951 (Fig. 2) and in 1953 (pp. 60-61 and Fig. 1). The burial was in the middle of the formation.

The skeleton was preserved in the Colongulac Loess, which was derived from the floor of Lake Colongulac when it was dry. Professor F. E. Zeuner carried out a grain size analysis in 1952, and reported a calcium carbonate content of up to 71%. This is because the brackish water lacustrine shell *Coxiella* was (and is) present in such vast numbers at Lake Colongulac. The non-calcareous sediments consist of 44% clay, 38% silt and 18% fine sand. The clay must have blown up as aggregates, probably from the fretting of the edges of polygons in cracked mud. If this is so, then the clayey loess was generated in times of seasonal drying. The high percentage of calcium carbonate provided the alkaline conditions that preserved the bones. The loess forms a lunette on the southeast side of the lake. The present prevailing winds are from the southwest, so at the time of formation of the lunette the prevailing wind was in a different quadrant.

Radiocarbon Dating

Dr. Athol Rafter of the Institute of Nuclear Sciences, New Zealand, kindly dated the skeleton by C14 (R4824) as follows:

On the half life of 5568 yr — 3600 ± 60 yr B.P.

On the half life of 5730 yr — 3760 ± 70 yr B.P.

Percentage w.r.t. Bone Standard 63.4 - 0.5; δ^{13} w.r.t. PDB -27.7‰; counting time 4000 minutes.

* 1/47 Wattle Valley Road, Canterbury, Victoria 3126.

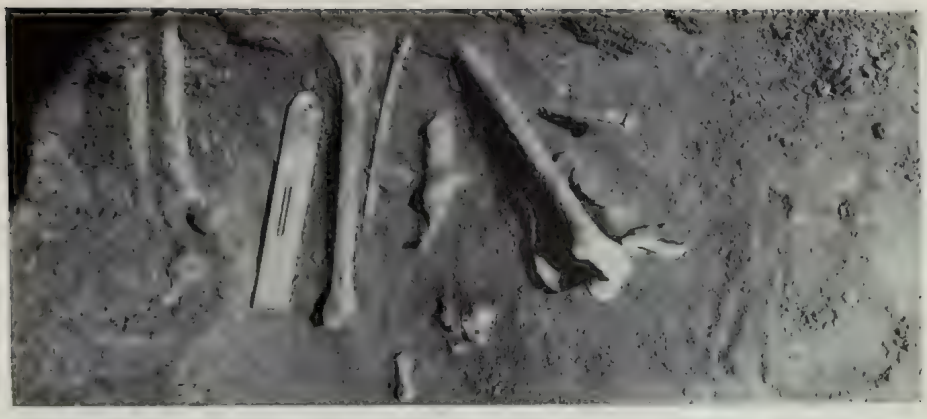

Fig. 1 (Top). The Colongulac Skeleton in situ in the Colongulac Loess in the lunette on the east side of the lake.
Fig. 2 (Centre). Lunette at Lake Colonguiac looking northeast from the site of the 20 100 yr sample.
Fig. 3 (Lower). Ditto, looking southwest.

Dr Rafter also dated a sample from the base of the Colongulac Loess in the same lunette, but further south the sample was collected in situ on January 30th, 1967, from approximately beach level (Pl. 1, figs. 2-3). The site is about half way between the sewerage tanks to the south and the promontory capped with trees on the S.E. shore a short distance north of a fenceline. The matrix had a very local slope of 30°, perhaps from a hole being dug in the ground; the dip was towards the lake. A layer up to 1 cm thick consisted of powdery charcoal and silt. The ground underneath was burned red. The date obtained on the charcoal was 20 100 ± 500 yr B.P. (NZ 780A); it was published in Gill 1971 (p. 75). The period during which the Colongulac Loess was laid down was one of the exceptional dryness which has been widely recognized (Bowler et al. 1976). The Harris' Lines of the long bones were checked to see if they gave any clue to environmental stress (Gill 1968).

New Interpretation of the Colongulac Skeleton

The bones of this Aboriginal skeleton certainly suggest a flexed burial. Then how were the small bones scattered, and the skull lost although three teeth remain? My hypothesis of baring (which could easily happen in the dry environment), then re-covering, still appears to me the best explanation. Because there was no sign of inclusion of soil, I presumed that the burial took place during the building of the dune. If the radiocarbon date is correct (and I have no reason to doubt that it is of the correct order of age) then this cannot be. The black soil on top of the formation varies from 0.3 to nearly 1m thick, and by analogy with other soils is older than the radiocarbon date. Moreover, the skeleton came from the middle of the formation. After the lunette was formed, lake level rose and a sloping cliff was formed. It must have been during the cutback of this cliff that the burial took place. Either the cliff was clear of soil at the time, or the soil was cleared away, because all the material surrounding the skeleton was yellow loess. It is surprising that the surface through which excavation was made to reach the skeleton appeared quite undisturbed. The fine system of cracks in the matrix did not appear to alter over this area. However, if the radiocarbon date is correct, the burial must be intrusive through the cliff face. At the time the excavation was made, drought conditions existed, and the ground at the skeleton site was bare. In Plate 1, figs. 2-3, the photographs were taken in 1967 when the sample for the 20 100 yr date was collected. There was plenty of vegetation, but it was at its annual minimum because the time was mid-summer.

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Treasurer Wanted

The Club urgently requires a treasurer to replace Mr D. E. McInnes who has decided to give up the position after many years valuable service. The prospective treasurer should preferably have some accounting experience and be a member of the FNCV, although this is not essential. If anyone would like to be considered for this very important job, please contact Dr Brian Smith (work: 669-9888).

Bush-peas of Victoria — Genus Pultenaea — 13

BY M. G. CORRICK*

***Pultenaea paleacea* Willd. in *Spec. Plant.* 2:506 (1799).**

This species occurs in scattered localities in eastern, central and southern Victoria and was apparently once quite plentiful in suburban areas of Melbourne such as Mt Waverley, Oakleigh and Brighton. It favours damp situations, sometimes along streams or in depressions among rocks, but is most commonly found on damp, sandy heathland. It is a variable species and several varieties have been named.

Pultenaea paleacea Willd. var. *palaecea* is a low growing, open and somewhat procumbent shrub. The stems are terete, the young growth covered with pale, closely appressed hairs but becoming glabrous with age.

The alternate, narrowly linear to elliptic or oblanceolate leaves are 7-20 mm long and 1-3 mm wide. The margins and the mucronate tip are recurved. The upper leaf surface is glabrous and the under surface is covered with pale, closely appressed hairs. The stipules are 5-6 mm long, closely appressed to the stem and joined at the base; they are light brown and papery in texture with a darker mid-rib.

The flowers are orange and deep purple-brown; they are axillary, but clustered in apparent heads at the tips of the branches. The orange standard is 11-12 mm high and 7-8 mm broad and has deep purple-brown markings in the throat; the wings are slightly tinged with purple and the keel petals are very dark purple.

The calyx is 7-8 mm long with rather coarse, pale, appressed hairs. The bracteoles are about 5 mm long, brown and papery and somewhat keeled with a line of hairs down the centre; they are attached below the middle of the calyx tube and reach almost to the tip of the lobes.

The inflorescence is subtended by floral bracts which show a gradation from leaves with enlarged stipules to a trifid bract on the innermost flowers.

The ovary is stipitate, with a tuft of hairs at the base and the remainder covered with dense, pale hairs which extend about one third of the way along the style.

The pod is flat, slaty-grey in colour and covered with pale, appressed hairs. Flowering time is usually mid-October to early November. SPECIMENS EXAMINED included: E. Gippsland, Bonang Highway, *A.C. Beauglehole 34962,* 25.xi.1970 (MEL 535403); ENE of Mt Ellery, *Edwin Merrah,* xi.1887 (MEL 533558); E. Gippsland, Yambulla Ck., *J. H. Willis,* 17.x.1948 (MEL 535404).

P. paleacea var. sericea Benth. in *Fl. Austr.2:*116(1864).

This is the common variety in Victoria and is the one found around Melbourne. It differs from the var. *palaecea* in its longer, paler foliage and longer, white-silky scarious floral bracts; the calyx and bracteoles are similar to the var. *paleacea.* It is also usually a smaller plant with slender, flaccid branches trailing among surrounding vegetation. Flowering time is late October to early November.

SPECIMENS EXAMINED included: Princes Highway W. of Bemm R., *A. C. Beauglehole 34223,* 1.x.1970 (MEL535411); N.E. of Yarram, *A. C. Beauglehole 62524,* 14.xii.1978 (MEL 513586); Langwarrin, nr. railway line, *M. G. Corrick 6174,* 12.xi.1978 (MEL 542133); in shady inundated places towards Brighton, *F. Mueller,* xi.1852 (MEL 533580) Syntype; Elaine, near

*7 Glenluss Street, Balwyn, 3103.

Burnt Bridge, *N. H. Scarlett*, 30.xii.1968 (MEL 535413); Mt Raymond road, *N. A. Wakefield 3494*, 1945 (MEL 1507306).

P. paleacea var. *williamsonii* (Maiden) H. B. Williamson in *Proc. Roy. Soc. Vict.* new ser. *32*:220 (1920).

This variety occurs around Strathbogie and Eildon. It is a less hairy plant than either of the preceding varieties with larger leaves up to 30 mm long and 9 mm wide. Its bracteoles are also larger and almost envelope the calyx; the floral bracts are similar to those of the var. *paleacea*. Flowering time is the first half of November.

SPECIMENS EXAMINED included: Eildon area, *B. Strange*, 12.xi.1962 (MEL 536106); Strathbogie, *A. W. Vroland*, xi.1902 (MEL 536319) Isotype; Bucklands Ridge, *J. H. Willis*, 21.xi.1975 (MEL 515051).

***Pultenaea linophylla* Schrad. in *Sert. Hannov.* 29 (1795).**

Pultenaea linophylla in Victoria is restricted to the lowlands of East Gippsland. It also occurs in New South Wales. It is a sparsely branched, rather stiff shrub, generally not more than 30-40 cm high and often trailing or almost prostrate. The stems are terete and pubescent on young growth.

The alternate, linear-elliptic leaves are 2-4 mm wide and 4-14 mm long. The upper surface is glabrous, dark green or occasionally tinged with brown down the centre. The margins are slightly recurved and the under side is sparsely covered with pale, rather coarse hairs. The leaf tip is obtuse and slightly recurved. The stipules are triangular, about 1 mm long, very dark brown and slightly recurved.

The rather small axillary flowers are orange and dark purple and are tightly

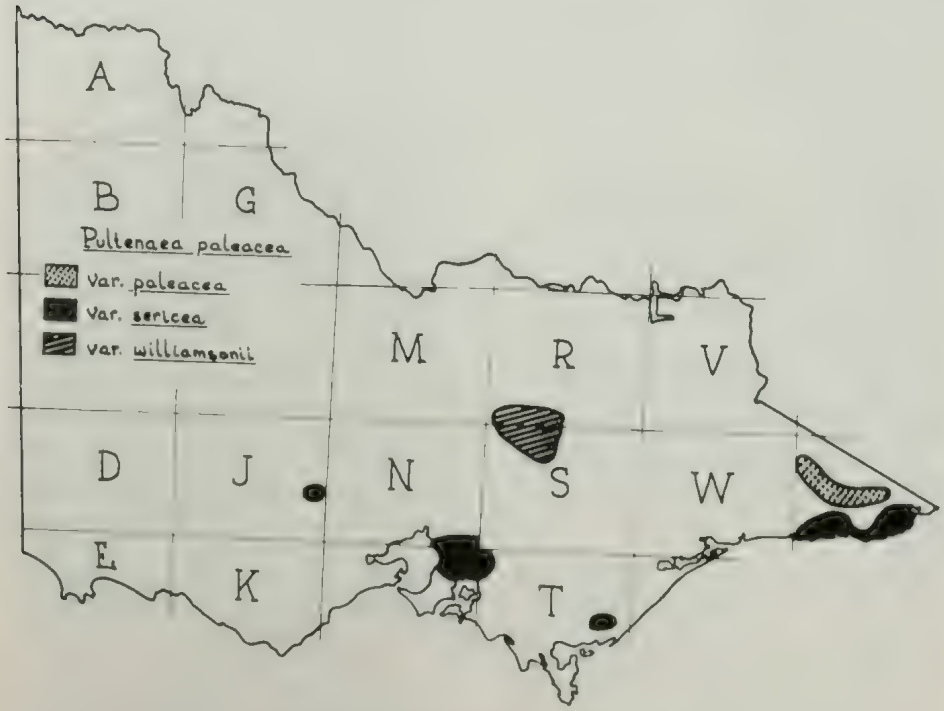

Fig. 16a. Known distribution of *Pultenaea paleacea*.

Fig. 16. a-i, Pultenaea paleacea var. *paleacea*; a, habit; b, calyx and bracteoles; c, bracteoles drawn a little larger; d, style and ovary; e, floral bract; f, leaves and stipules; g, stipules; all from MEL 516884; h, pod and seed; i, broad leaf; from MEL 535403. j-l, *P. paleacea* var. *williamsonii;* j, leaf and stipule from MEL 515051; k, calyx and bracteoles, bracteole drawn a little larger; l, style and ovary; from MEL 533537. m-o, *P. paleacea* var. *sericea;* m, leaves and stipules; n, stipule; o, floral bract; all from MEL 242133.

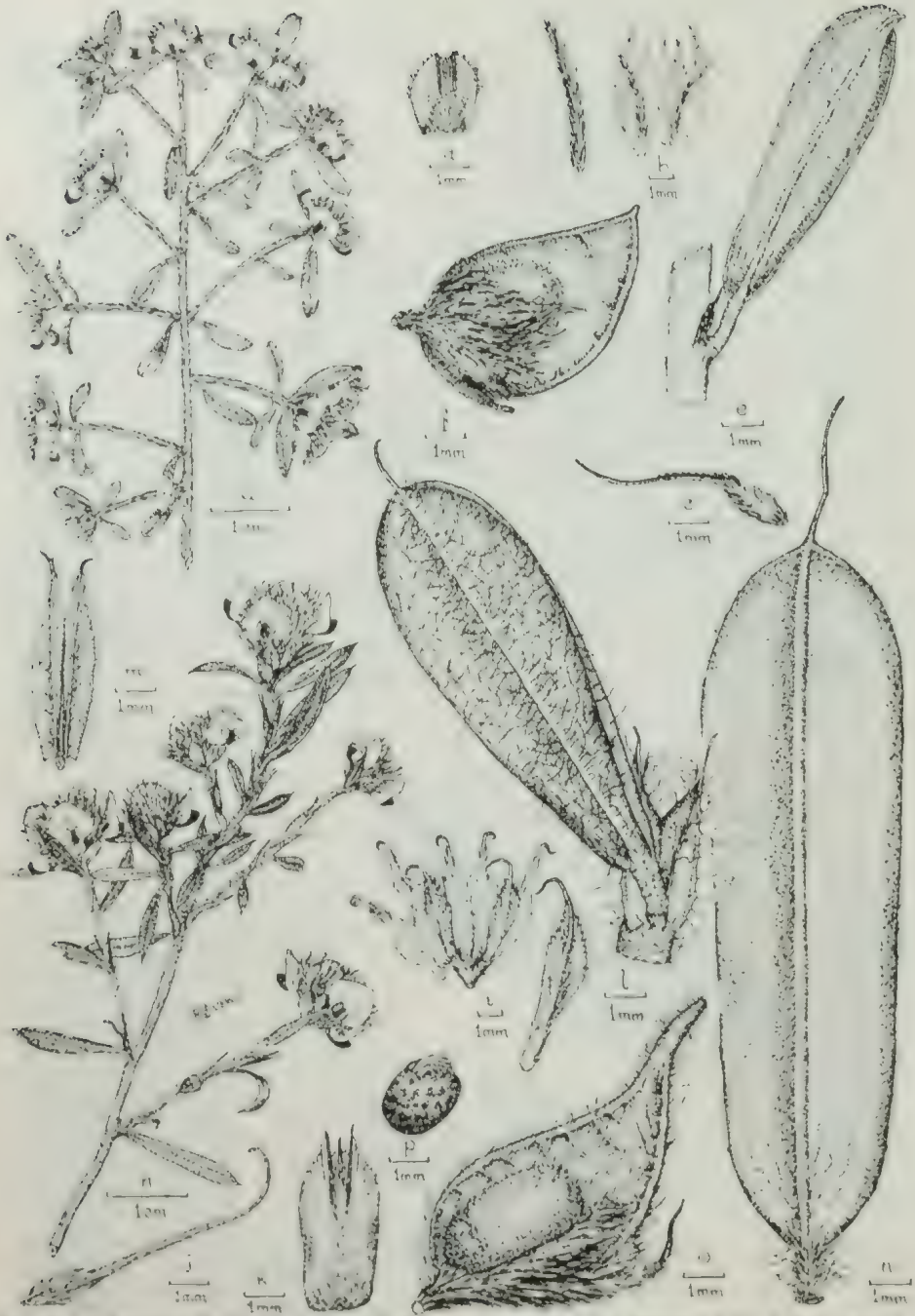

Fig. 17 a-f, *Pultenaea limophylla*. a, habit; b, calyx and bracteoles, one bracteole drawn a little larger; c, style and ovary; d, floral bract; e, leaf and stipules, all drawn from MEL 1513602; f, pod from MEL 1513599.

h-p, *P. pohlfolia*. h, habit; i, calyx and bracteoles, one bracteole drawn a little larger; j, style and ovary; k, floral bract, l, leaf and stipules; m, stipules; all from MEL 560729; n, large leaf form from Hume River, MEL 1504025; o, pod from MEL 1504012; p, seed, from MEL 1504019.

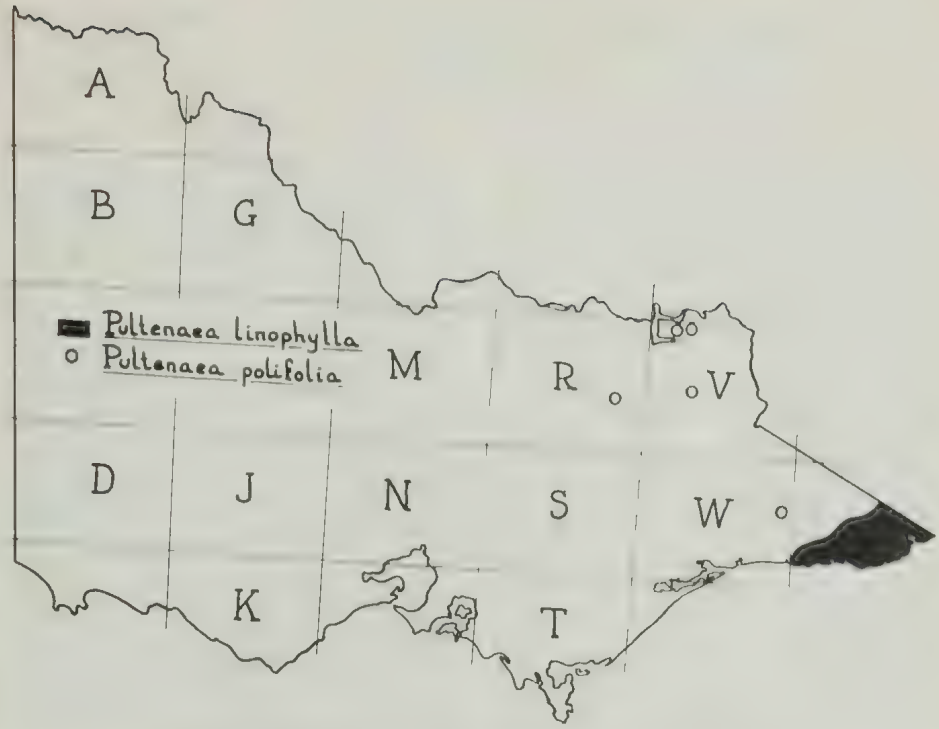

Fig. 17a. Known distribution of *Pultenaea linophylla* and *P. polifolia*.

clustered in apparent heads at the tips of branchlets. The standard is 6-7 mm high and 5-6 mm wide; both it and the wings are pale orange marked with purple lines. The keel is dark purple.

The calyx is about 5 mm long with very slender, acute lobes; it is covered with pale, loose hairs which are thickest at the top of the tube. The lanceolate, very hairy bracteoles are attached about half-way up the calyx tube and reach to about half-way along the calyx lobes. The flowers are subtended by persistent, papery, ovate floral bracts which are slightly hairy, particularly down the centre. The inner, longer bracts may split, giving them a bifid, or even trifid appearance; in the latter case the central lobe is usually composed merely of the central line of hairs.

The ovary is densely covered with pale, silky hairs which extend along one side of the style for about half its length. The pod is flat, well exserted from the calyx and covered with pale hairs.

The Victorian form of *P. linophylla*, a short-leaved, usually trailing or prostrate plant, extends into southern New South Wales, particularly around Eden. The common New South Wales form differs in having much longer leaves, which are oblong-cuneate and up to 3 cm in length. N. A. Wakefield described the Victorian form as *P. amoena* Sieber ex N. A. Wakefield, but Joy Thompson (1961)* reduced it to synonymy under *P. linophylla*, a decision which J. H. Willis (1972)* upholds. Flowering time in Victoria is late September to early October. SPECIMENS EXAMINED included: Lind National Park, *A. C. Beauglehole 34154*, 27.ix.1970 (MEL 1513601); N. slope of Mt Raymond, *A. C. Beauglehole 31288*, 26.x.1969 (MEL 1513599); Green Cape N.S.W., *M. G. Corrick 5964* (MEL 1513602).

***Pultenaea polifolia* A. Cunn. in Field *Geogr. Mem. N.S.W.* 346 (1825).**

Pultenaea polifolia is a very uncommon species in Victoria, having been recorded in a few scattered localities in the north-east of the State. It also occurs on the Sydney sandstones. It may be up to 1 m high with terete stems which are pubescent on the young growth but become glabrous with age.

The alternate, elliptic, or slightly obovate leaves are 2-7 mm wide and 8-30 mm long with recurved margins. The leaf tip is obtuse, terminating in a conspicuous but weak mucro. The upper leaf surface is glabrous with a distinct central groove; the under surface is pubescent with rather loose, spreading, pale or slightly rusty hairs. The papery, pale stipules are about 3 mm long.

The orange and dark purple-brown flowers are axillary, but clustered in apparent heads at the tips of the branches and subtended by persistent floral bracts. The standard is about 10 mm high and 7 mm wide.

The calyx is 7-8 mm long with very slender, tapering lobes which are about equal in length to the tube and often hooked at the tips. It is hirsute with rather long, pale spreading hairs which are denser at the base of the tube and on the lobes.

The lanceolate, keeled bracteoles are attached to the lower half of the calyx tube and have a line of pale hairs down the centre. The brown floral bracts are trifid with a very slender, weak central lobe and are hairy on the back.

The ovary and base of the style are covered with pale hairs. Good fruiting material has not been seen, but the pods are apparently flat and well exserted from the calyx. Flowering time is late October to mid November.

A wide leafed form which occurs in the Ovens Valley and on Mt Granya has been known as *P. polifolia* var. *mucronata* (F. Muell.) H. B. Williamson. However, in view of the extremely variable leaf size and degree of hairiness throughout the range of the species, and also on individual plants, the recognition of this variety seems hardly justified. Examination of the material at present available in the National Herbarium, Melbourne, does not uphold Williamson's observations of consistent differences in the shape and position of the bracteoles, which he used as an additional distinguishing feature of the variety.

SPECIMENS EXAMINED included: Yalmy River, *A. C. Beauglehole 43401*, 23.x.1973 (MEL 516035); Hume River, *C. French Jnr.*, xi.1886 (MEL 1504025); Bonang Highway, *H. van Rees 68 and S. Forbes*, 25.x.1979 (MEL 560729).

*See *Vict. Nat.* 93(5):178 (1976) for references.

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Rare and Endangered Victorian Plants

1. Acacia enterocarpa

BY J. STUWE*

A recent paper (Hartley and Leigh, 1979) uses existing publications and herbarium specimens to suggest a list of native vascular plants 'considered to be at risk and hence meriting special consideration for conservation'. The plants listed are those thought to be at risk on an Australia-wide basis. This preliminary list opens the way for more detailed work where all known stands of given species are subject to field inspection to determine their conservation status at the present time. Such data, including suggested conservation measures, are being compiled in a standardized format for each species and sent to the relevant management agencies in an attempt to ensure the species' survival. The present paper is the first of a series describing such work on Victorian plants which are thought to be rare or endangered. The aim of the series is to summarize the results of recent field inspections and earlier work, to ask whether any other populations of the species are known to readers and to ask whether readers can offer any help in monitoring the populations in the future. The species to be dealt with here is *Acacia enterocarpa*, Jumping-jack Wattle.

Range and abundance

In Victoria, the species is restricted to the Diapur/Broughton area of the Wimmera, mainly on the northern Lawloit Range. Most of the few known populations are roadside with one stand on the rail enclosure near Diapur and about sixty plants on public land (a type of 'water reserve') near Broughton. No natural populations occur in any biological reserve although about one hundred have been planted in a relatively small, Lands Dept. Flora Reserve (the species probably once grew naturally there). The seed was collected from an adjoining population and grown at Wail Nursery.

The species occurs within minor grids C11, C12 and C21. A rough estimate of the total number of plants of this species in Victoria is about six hundred. It also occurs in South Australia on the Southern Eyre Peninsula, near Mundalla (S.W. of Bordertown) and near Kongal, west of Bordertown (Eichler 1965; A. J. Hicks, pers. comm.). It was classed as "Vulnerable (4V)" on an Australia-wide basis by Hartley and Leigh (1979). Because of its limited Victorian range, precarious situation (roadsides and rail enclosure) and small population sizes, it has been classed "Endangered" within Victoria in the present work (this risk code is second only to "Extinct"). Exhaustive searches were not undertaken for old records labelled "Serviceton, South Australia border" (1887), "Yanac" (1934) and "Nhill" (1897). It is possible that these or other, presently undiscovered, populations will be located with further field work. We would like to know of any records of the species from Public Land not mentioned above, with a view to requesting further reservations.

Habitat and species' ecology

The species ranges from mallee broombush on the highest parts of the northern Lawloit Range on gravelly duplex ironstone soils to mallee scrub and grassy woodlands of *Eucalyptus leucoxylon*, *E. microcarpa* and *Casuarina luehmannii* on more fertile, brown loamy soils in adjacent areas. Regeneration has been observed in ob-

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viously disturbed sites but also has been seen in apparently undisturbed ones.

Threats and recommended conservation measures

Where possible, care should be taken to minimise destruction of *A. enterocarpa* plants when undertaking works or fire prevention methods associated with the roads or railway.

Because most plants occur in areas not conducive to their long-term survival, it is essential to adequately reserve certain areas in an attempt to conserve the species in perpetuity. Such measures suggested were:

(a) Reservation and fencing of at least that part of the "water reserve" near Broughton carrying this species, as a flora reserve.

(b) Reservation (e.g. as a roadside flora reserve) and fencing of two relatively wide, triangular areas of road reserve between Kaniva and Broughton.

(c) The continued maintenance and careful management of the Flora Reserve at Diapur into which the species has been planted.

The biggest deficiency in the suggested reserve system is that the most common habitat for the species, mallee broombush on infertile ironstone soils on the Lawloit Range, is not included. Of the few known fragments remaining of this type, the rail reserve near Diapur is the best. Its conservation deserves special emphasis to try to ensure adequate conservation of the total remaining *Acacia enterocarpa* gene pool. We would especially like to hear from any reader who may know of the occurrence of this species on blocks of Public Land from the above habitat.

Recommendations sent to:

Shire of Kaniva, Shire of Lowan, Land Conservation Council, Department of Crown Lands and Survey, Ministry for Conservation.

Acknowledgements

I wish to thank Mr A. J. Hicks, Kaniva and Mr W. Middleton, F.C.V. Horsham for valuable discussion and assistance in locating populations of this species. The work is funded in part by a grant from the National Estate Programme of the Australian Department of Home Affairs.

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The genus *Luzula* in Victoria

BY DAVID COOKE*

Along with the great variety of rushes in the genus *Juncus* L., the family Juncaceae also contains a number of species sometimes known as woodrushes in the closely allied genus *Luzula* DC. Both genera comprise herbaceous plants with basal leaves and terminal cymose inflorescences of minute, wind-pollinated flowers, each with a perianth of six tepals. The fruit is a capsule, in *Juncus* trilocular with numerous very small seeds, in *Luzula* unilocular with three relatively large seeds each with a whitish fleshy outgrowth, the caruncle.

In the past, all Victorian specimens of *Luzula* have been regarded as belonging to the European species *L. campestris* (L.) DC. Although this species has been introduced into the southern hemisphere, it is not known to occur in Victoria; instead, we have at least 10 native species. Like *L. campestris*, these all belong to the subgenus *Gymnodes*.

The following key may be used to differentiate the *Luzula* species known from Victoria. The letters following each species name refer to the major grids (Churchill and de Corona 1972) for which the species has so far been recorded.

1. Leaves flat, flaccid; caruncle more than one-fifth the length of seed . . . 2.
   Leaves channelled, erect; caruncle less than one-fifth the length of seed (alpine plants) . . . . . 7.
2. Inflorescence of several flower clusters on long bare stalks radiating from a central point, resembling a compound umbel; leaves hairy . . . . 3.
   Inflorescence of a single congested flower cluster or several clusters crowded together, never umbelloid (if ever with manifestly stalked flower clusters, then the leaves almost glabrous) . . . . . 5.
3. Tepals black or very dark brown, without a pale margin . . . . . *L. meridionalis* Nordenskiold
   Grids CDEJKMNR
   Tepals brown with pale margins . . . 4.
4. Leaf margins densely hairy; capsule dark at maturity; base of plant usually bulbous . . . . . *L. densiflora* (Nordenskiold) E. Edgar
   Grids CHJNPRSZ
   Leaf margins with a few scattered hairs; capsule usually pale; base of plant never bulbous . . . . . *L. flaccida* (Buchenau) E. Edgar
   Grids BDEJKNPSTVWZ
5. Flower less than 2.3 mm long, anthers less than 0.5 mm long, inflorescence consisting of a single ovate head . . . . . *L. ovata* E. Edgar
   Grids DVW
   Flower more than 2.5 mm long, anthers more than 0.5 mm long, inflorescence consisting of one to few flower clusters . . . . . 6.
6. Plant tufted, leaves almost glabrous; inflorescence consisting of a sessile flower cluster with one or more similar clusters on short spreading stalks . . . . . *L. novae-cambriae* Gandoger
   Grid W
   Plant with long rhizomes, leaves hairy; inflorescence consisting of one to four sessile flower clusters closely packed together . . . . . *L. modesta* Buchenau
   Grids RSV
7. Leaf tips acute . . . . . *L. acutifolia* Nordenskiold
   Grids VR
   Leaf tips obtuse, ending in a minute swelling . . . . . 8.
8. Flower more than 2.8 mm long, anther about 1 mm long . . . . .

*9/51 Marne Street, South Yarra, Victoria 3141.

..... *L. australasica* Steud. ssp. *dura* (E. Edgar) Jansen Grid V

Flower less than 2.6 mm long, anther about 0.5 mm long.....9.

9. Plant tufted, leaves prominently hairy ..... *L. alpestris* Nordenskiold Grid V

Plant with long rhizomes, leaves glabrous except for a few hairs at the base ..... *L. atrata* E. Edgar Grid V

Specimens with characters intermediate between some of the above taxa also occur in Victoria. In the alps *L. modesta* appears to intergrade with *L. novae-cambriae*, perhaps due to hybridization; apparent hybrids between *L. densiflora* and *L. modesta* are also recorded.

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Notes on *Trithuria* in Victoria

Trithuria submersa Hook.f. is a minute pioneer annual growing on moist open ground such as the mud surrounding temporary pools and stream verges. In this niche it is an advantage for a plant to be able to complete its life cycle rapidly while moisture conditions are favourable; a greatly simplified and condensed structure is an adaptation to this end. In this adaptive strategy, and especially in having dense heads of unisexual flowers, *Trithuria* parallels genera of the Centrolepidaceae, with which family it was formerly lumped. It is now regarded as the sole Victorian member of the Hydatellaceae (Hamann 1976).

Development

The linear leaves form a basal tuft, within which a number of flower heads are produced in September to December. The scapes are very short at anthesis but usually grow from 1 to 4 cm tall by the time the fruits are ripe in October to February. Occasionally the scapes do not elongate, and the fruits are borne near ground level; it may be that scape development is a function of moisture availability and is suppressed in dry conditions.

Inflorescence

The head is surrounded by two pairs of opposite, acuminate, one-nerved bracts at right angles to each other, forming a false whorl of four. In some well-developed heads another one or two pairs of narrower bracts are found alternating with the first four.

The male florets, 2 to 6 per head, are each reduced to a single stamen. They are scattered among 10 to 20 female florets, each consisting of a solitary ovary formed from three carpels. There are three styles, although each is usually divided into two from the base.

It is uncertain how *Trithuria* is pollinated; although the florets have no obvious means of attracting pollinators, their position close to the ground would make wind pollination very inefficient. The close grouping of male and female florets in the same inforescences suggests self-pollination.

The fruits are single-seeded capsules which split open along the three sutures between the carpels to shed the seed, although the entire, partly opened fruit is often shed from the head with the seed inside.

Distribution

Trithuria submersa is common in western Victoria, with scattered populations as far east as Winton and Port Phillip Bay, and also occurs in Western Australia, South Australia, Tasmania and New South Wales. It is recorded from major grids B C D E J K N P R.

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D. Cooke 9/51 Marne St., South Yarra. 3141.

Inflorescence of *Trithuria submersa*, half of the florets removed. X10.

Observations on the Leaf-Curling Spider, *Phonognatha graeffei*

From about midsummer, until early winter each year, the trees and shrubs in my garden, are festooned with the orb-webs and leaves of the Leaf-curling Spider (Phonognatha graeffei).

One of the most intriguing features of the life history of this spider is the manner in which it selects, shapes, and places in its web, the leaf in which it spends so much of its life. Plate 1, illustrates a popular type of curled-leaf construction favoured by this spider; however, there are quite a few variations of this style.

During the day, the spider usually remains in its leaf retreat, with just the ends of some of its legs showing; patiently waiting for an insect to blunder into its beautifully constructed web.

When it is time for the female to lay her eggs, she selects a leaf, then usually bends it across the centre as shown in Plate 2. After depositing her egg-sac in the leaf, she seals it down, thus making a cosy weatherproof shelter for her offspring.

On the 29.8.78, I found a folded leaf (Plate 2) containing the egg-sac of a P. graeffei; it

Plate 1: A common type of curled eucalypt leaf, used by Phonognatha graeffei. (Photo: author).

Plate 2: A transversely folded eucalypt leaf, used by a female Phonognatha graeffei for storing its egg-sac. (Photo: author).

was suspended from a strand of silk, and was swinging from a branch of a plum tree.

Keeping the leaf under observation, I was pleased to observe on the 5.12.78, that spiderlings were emerging from their "home". The final count of the spiderlings contained in the leaf, amounted to 166.

On the 5.4.79, I found a female P. graeffei in a Pittosporum undulatum in the garden; she was putting the finishing touches to a folded Acacia longifolia leaf, which was also suspended from a branch by a strand of silk, see Plate 3. Heavy rain set in, and the next day she was seen clinging to the leaf; this proved to be the last sighting of her. The leaf was kept under observation, and on the 11.12.79, spiderlings started to emerge, the final tally showed a total of 89.

Although Leaf-curling Spiders do not produce very large families; the number of them observed each year, indicates just how effective their leaf shelters must be, in avoiding predators such as birds and wasps.

From the amount of insects caught by these spiders, it is apparent that they must play a very important role in helping Nature preserve her fragile balance.

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A. E. Spillane, 99 Rutland Ave, Mt Eliza, 3930.

Plate 3: A female Phonognatha graeffei, on a folded Acacia longifolia leaf containing its egg-sac (approximately 3x). (Photo: author).

Movement Over the Snow Surface by the Bush Rat, *Rattus fuscipes*

BY W. S. OSBORNE*

Evidence of ranging, and dispersal over long distances by the Bush Rat, *Rattus fuscipes*, is well documented. Dispersal movements by adult *R. fuscipes* of up to 213 metres for females, and 760 metres for males, were recorded in Victoria by Warneke (1971). In south-eastern Queensland, Wood (1971), describes dispersal movements of between 180 metres and 370 metres for *R. fuscipes*. Males and females were equally involved in this dispersion although males had significantly larger observed range lengths (90-106 m. in females and 183-198 m. in males).

Similarly during a program of small mammal trapping carried out in a sub-alpine region of Kosciusko National Park, dispersal distances of up to 400 metres for both male and female *R. fuscipes* were recorded, with range distances of around 100 metres being frequently covered (Green and Osborne, unpublished data).

During the period of deep snow cover all the small mammals in the sub-alpine and alpine regions of the Kosciusko National Park are subnivian (dwelling below the snow) and move about via a system of runways at ground level. The possibility, therefore, of long distance movement over the snow surface by *R. fuscipes* is perhaps unexpected. During the winters of 1978 and 1979, however, small mammal tracks were frequently encountered on the snow surface (Figure 1). These tracks were usually associated with rock piles and leaning trees where small openings occurred in the snow cover. Occasionally several sets of tracks led to and from these holes.

In July 1979 when snow cover was generally greater than 1 metre in depth, 25 sets of small mammal tracks were en-

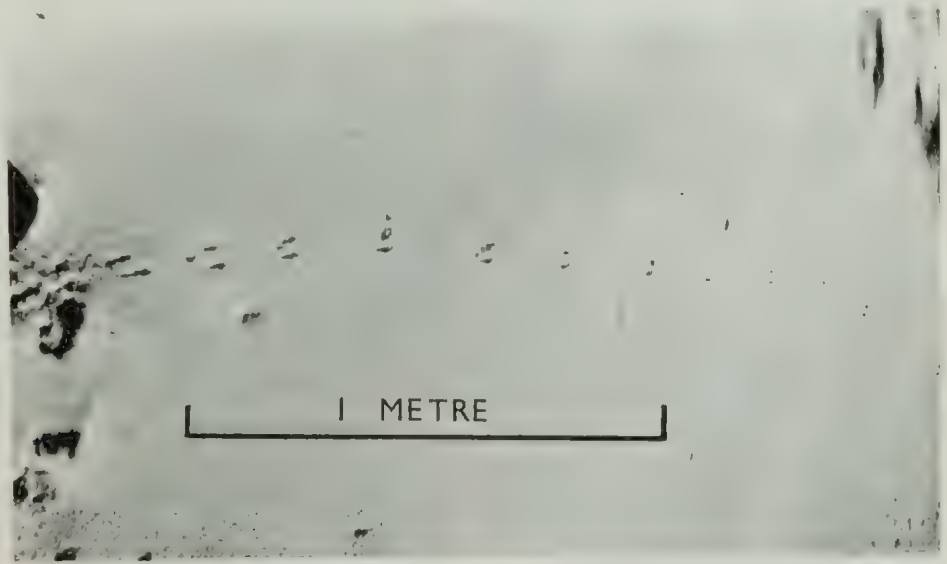

Fig. 1. Small mammal tracks leading off a snow covered road at Schlink's Pass, Kosciusko National Park, July 1979.

*7 Hamelin Crescent, Red Hill, A.C.T., 2603.

Fig. 2. Small mammal tracks and fox tracks at Duck Creek, Kosciusko National Park, July 1978.

countered during a twelve kilometre ski transect in the sub-alpine region. These tracks were found to range from 1 to 500 metres in length, with the mean track length being 62 metres. Of the 25 tracks examined, 7 of the tracks extended for a distance of greater than 100 metres. In some cases the tracks clearly showed the manus pattern characteristic of rodents. *R. fuscipes* and *Mastacomys fuscus*, both rodents, are present in the area. It is unlikely though, that any of the tracks were made by *M. fuscus* because:

1. Many of the tracks were present in areas not normally frequented by *M. fuscus;*
2. *R. fuscipes* occasionally ran over the snow surface after being released from traps, but *M. fuscus* in all cases moved quickly down spaces leading under the snow; and
3. Traps set on the snow surface outside of holes with small mammal tracks leading into them only caught *R. fuscipes*.

There could be several possible reasons why *R. fuscipes* travels over the snow surface. If the lengthy movements of *R. fuscipes* during the snow free period are also maintained during the period of snow cover, then it would be necessary for individuals to sometimes move over the snow in areas where subnivian runways have not been constructed. Small mammal tracks observed on snow covered roads would probably be an example of this kind of movement. In addition, movement over the snow surface by *R. fuscipes* probably provides an effective means of dispersal. Intraspecific competition is possibly elevated during the period of snow cover, when resources may be scarce, and if so, movement onto the snow surface would be one means of avoiding conflict, although it exposes the individual to predation (Figure 2).

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Wood, D. H. (1971) The Ecology of *Rattus fuscipes* and *Melomys cervinipes* (Rodentia: Muridae) in a South-east Queensland Rainforest, *Aust. J. Zool.* **19:** 173-89.

A Check List of Victorian Gasteromycetes

The Gasteromycetes form a heterogeneous group within the Basidiomycetes, comprising about 150 genera and about 700 species. They are cosmopolitan but are particularly plentiful in Australia where certain species often form mycorrhiza with eucalypt roots. The fruiting bodies have a variety of curious forms including puff balls, earth stars and bird's nest fungi. Most Gastromycetes are terrestial, a number subterranean and they are generally considered to be the 'highest' fungi.

A brief explanation of the basic structure of the fruiting body is given here to assist collectors to identify their finds with the aid of the books listed as references. The one-celled basidium usually produces four spores, but sometimes more or less and they differ from most Basidiomycetes in that the spores are not forcibly discharged and sometimes not stalked. The basidia and spores mature within the fruiting body which remains closed until disintegrated by weathering or at least until the basidia have disintegrated. The basidia usually open into cavities within the fruiting body and the spores are released into these cavities as the tissues break down or dry out. The fruiting body wall or peridium consists of one or more layers covering a more or less fleshy material, the gleba, containing cavities lined with the spore-forming tissue or hymenium. This structure can only be distinguished in young fruiting bodies. The gleba is frequently crossed by sterile tissue, the columella and capillitium, which may facilitate spore dispersal after the decay of the gleba.

The Gasteromycetes, fungi commonly known as "Puff-balls", are therefore characterized, at least in the early stages of development, by having the spores form within a receptacle or sac. The subsequent development of the various families and genera takes many diverse forms, some of them quite bizarre in appearance.

For convenience of recognition in the field the Gasteromycetes may be divided into several groups with similar larger features but not necessarily closely related scientifically.

The first and most widespread and common of these groups is the one from which the name "Puff-ball" originated. In this group the spores develop inside a stalkless receptacle which is usually globose or some closely related shape. At maturity the receptacles are either on the surface of the ground, partially immersed in soil or they complete their development totally submerged in the soil, usually around the bases of trees. Earth Stars (*Geastrum*) may be included in this group.

In the second group the globose or subglobose sac is present but is raised to varying heights on stalks that may vary considerably in shape and size and, in at least one genus (*Calostoma*) may be gelatinous. These stalked Gasteromycetes are usually found in desert or sandy areas and, with the exception of *Calostoma*, are rarely found in the wetter or more heavily timbered localities.

In the third group the spore-bearing part develops within a sac which is usually white and on the surface of the ground. At maturity the sac is ruptured and the fruiting body emerges. This may be a latticed ball (*Clathrus*), horn-shaped or divided up in many different ways. It may be white or brightly coloured, usually some shade of red, the whole often accompanied by an evil smell which attracts insects that assist in the distribution of the spores. These are the Phallales, commonly known as "Stinkhorns".

The main and most easily recognizable members of the fourth group are the "Bird's Nest Fungi". In this group the spores develop within small capsules (peridiola) and are contained until maturity within a small cup-shaped receptacle, usually in clusters on fallen twigs and branches. The peridiola or "eggs" are often covered at first by a lid or epiphragm that falls away at maturity, leaving the exposed peridiola to be dispersed by the impact of falling rain drops or other not so apparent physical means.

There are some genera that will not fit satisfactorily within these four groups but some familiarity with Gasteromycetes in the field will soon enable the curious naturalist to recognize them as members of the class.

For eighteen years since 1962 the senior authors have collected Gasteromycetes widely in Victoria with, unfortunately, least attention to the North-western areas. During this period we have examined microscopically thousands of specimens in both the fresh and

the dried states and it has become apparent to us that a wide range of variation exists in all groups outside published generic and specific limits. This applies mainly to the Hymenogastrales, Sclerodermales and Lycoperdales.

The most satisfactory, indeed the only, work available initially was the excellent *Gasteromycetes of Australia and New Zealand* by G. H. Cunningham and published privately in 1943. This has been used as the standard work of reference throughout and most collections have been referred to the nearest genus and species in that work. It was early realized that in the vast number of Gasteromycete collections available to us there were probably many new species and even genera, but that little benefit would arise from describing new taxa within the framework of what was rapidly becoming a partially outdated taxonomy.

In 1973 there was published *The Fungi, Vol. IV B* in which articles by Alexander H. Smith and D. M. Dring set out more satisfactory frameworks in which three of the major families of the Gasteromycetes, the Hymenogastrales, Sclerodermales and Lycoperdales could be distributed. However, as this improved taxonomy is still in a state of flux, and little information is available to us at present on new combinations or species that may have been published — if indeed any have — we feel that the most useful action is still to refer all known Victorian species and genera to Cunningham's taxonomy. This we have done. All species recorded by Cunningham for Victoria that have not been seen by us are marked with an asterisk.

For those who wish to compare Cunningham's taxonomy with that in *The Fungi, Vol. IV B* an equivalent list has been provided in which the various families and genera in Cunningham are compared with those of the new taxonomy as closely as possible.

The following is a list of works that are useful in Gasteromycete identification:

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G. H. CUNNINGHAM	THE FUNGI VOL. IV B
HYMENOGASTRALES	
Hymenogastraceae	
Rhizopogon Fr.	Hymenogastrales: Rhizopogonaceae
Hymenogaster Vitt.	Hymenogastrales: A Gasteroid genus of the Cortinariaceae
Octaviania Vitt. (in part)	=*Octavianina* Kze. Kymenogastrales: Position uncertain.
Octaviania Vitt. (in part)	=*Leucogaster* Hesse Hymenogastrales: Position uncertain.
Richoniella Cost. & Duf.	Hymenogastrales: A Gasteroid genus of the Entolomataceae
Hydnangium Wallr.	Hymenogastrales: Position uncertain.
Hysterangium Vitt.	Phallales: Hysterangiaceae
Gymnoglossum Mass.	Not listed.
Gautieria Vitt.	Gautieriales: Gautieriaceae, or Hymenogastrales: A Gasteroid genus of the Cortinariaceae
Secotium Kze.	Hymenogastrales: Secotiaceae

PHALLALES
Phallaceae
Mutinus Fr.
Phallus L. ex Pers.
Dictyophora Desv.
Clathraceae
Anthurus Kalch. & Mcowan
Aseroe Labill.
Clathrus Mich. ex Pers.
SCLERODERMALES
Calostomataceae
Calostoma Desv. ..... Tulostomatales: Calostomataceae
Sclerodermataceae
Scleroderma Pers. ..... Sclerodermatales: Sclerodermataceae
Pisolithus Alb. & Schw. ..... Sclerodermatales: Sclerodermataceae
LYCOPERDALES
Lycoperdaceae
Mesophellia Berk. ..... Lycoperdales: Mesophelliaceae
Castoreum Cke. & Mass. ..... Lycoperdales: Mesophelliaceae
Mycenastrum Desv.
Disciseda Czern.
Bovista Dill. ex Pers.
Lycoperdon Tourn. ex Pers. In part =*Morganella* Zeller
Calvatia Fr.
Geastrum Pers. ..... Lycoperdales: Geastraceae
Astraeus Morgan. ..... Sclerodermatales: Astraeaceae
Tulostomataceae
Tulostoma Pers. ..... Tulostomatales: Tulostomataceae
Battarraea Pers. ..... Tulostomatales: Tulostomataceae
Phellorinia Berk. ..... Tulostomatales: Tulostomataceae
Chlamydopus Speg. ..... Tulostomatales: Tulostomataceae
NIDULARIALES
Nidulariaceae
Nidula White
Nidularia Fr.
Mycocaelia Palmer
Crucibulum Tul.
Cyathus Haller ex Pers.
Sphaerobolaceae
Sphaerobolus Tode ex Pers.

BASIDIOMYCOTINA
GASTEROMYCETES
Hymenogastrales
Hymenogastraceae
Rhizopogon clelandi G. H. Cunn.
luteolus Fr.
rubescens Tul.
Hymenogaster albellus Mass. & Rod.
albus (Klotzsch) Bark. & Br.
aureus Rod.
fuligineus G. H. Cunn.
fusisporus Mass. & Rod.
levisporus Mass. & Rod.
nanus Mass, & Rod.
reticulatus G. H. Cunn.
tasmanicus G. H. Cunn.
viscidus Mass. & Rod.
zeylanicus Petch
Octaviania alveolata Cke. & Mass.
flava (Rod.) G. H. Cunn.
glabra (Rod.) G. H. Cunn.
hinsbyi (Rod.) G. H. Cunn.
megaspora (Rod.) G. H. Cunn.
pallida Mass. & Rod.
redolens G. H. Cunn.
seminuda Mass. & Rod.
stricta G. H. Cunn.
tasmanica (Kalchbr. ex Mass.) Lloyd
Richoniella cf. *leptoniispora* (Rich.) Cost. & Duf.

sp.
sp.
Hydnangeum carneum Wall.
glabrellum (Zeller & Dodge) G. H. Cunn.
Hysterangium aggregatum Cribb
affine Mass. & Rod.
hautu G. H. Cunn.
inflatum Rod.
moslei (Berk. & Br.) Zeller & Dodge
tunicatum G. H. Cunn.
Gymnoglossum fulvum (Rod.) G. H. Cunn.
stipitatum Mass.
violaceum (Mass. & Rod.) G. H. Cunn.
viscidum Cribb
Gautieria albida (Mass. & Rod.) G. H. Cunn.
clelandii G. H. Cunn.
costata G. H. Cunn.
macrospora G. H. Cunn.
mucosa (Petri) Zeller & Dodge
rodwayi (Mass.) Zeller & Dodge
Secotium areolatum G. H. Cunn.
coarctatum Berk.
leucocephalum Mass.
piriforme Clel. & G. H. Cunn.
porphyreum G. H. Cunn.
rodwayi Mass.
**scabrosum* Cke. & Mass.
sessile Mass. & Rod.
Phallales
Phallaceae
Mutinus **borneensis* Ces.
cartilagineus J. H. Willis
Phallus rubicundus (Bosc.) Fr.
Dictyophora **multicolor* Berk. & Br.
Clathraceae
Anthurus archeri (Berk.) Fisch.
javanicus (Penzig) G. H. Cunn.
Aseroe rubra LaBill. ex. Fr.
Clathrus **cibarius* (Tul.) Fisch.
gracilis (Berk.) Schlecht.
**pusillus* Berk.
Sclerodermales
Calostomataceae
Calostoma fuscum (Berk.) Mass.
rodwayi Lloyd
sp.
Scleroderma taceae
Scleroderma australe Mass.
bovista Fr.
flavidum Ell. & Ev. forma *macrosporum* G. H. Cunn.
cf. *geaster* Fr.
radicans Lloyd
verrucosum (Vaill.) Pers.
Pisolithus microcarpus (Cke. & Mass.) G. H. Cunn.
tinctorius (Mich. ex. Pers.) Coker & Couch
Lycoperdales
Lycoperdaceae
Mesophellia arenaria Berk.
castanea Lloyd
glauca (Cke. & Mass.) Reid
novae-zelandiae G. H. Cunn.
**pachythrix* (Cke. & Mass.) Lloyd
Castoreum cretaceum (Lloyd) G. H. Cunn.
radicatum Cke. & Mass.
Mycenastrum corium (Guers.) Desv.
Disciseda anomala (Cke. & Mass.) G. H. Cunn.
**australis* G. H. Cunn.
cervina (Berk.) Hollos
**hypogaea* (Cke. & Mass.) G. H. Cunn.
pedicellata (Morgan) Hollos
**verrucosa* G. H. Cunn.
Bovista apedicellata G. H. Cunn.
brunnea Berk.
verrucosa G. H. Cunn.
Lycoperdon asperum (Lev.) de Toni
glabrescens Berk.
gunnii Berk.
hiemale Bull.
nitidum Lloyd.
perlatum Pers.
polymorphum Vitt.
pusillum Pers.
pyriforme Schaeff. ex Pers.
scabrum (Lloyd) G. H. Cunn.
spadiceum Pers.
subincarnatum Peck
Calvatia candida (Rost.) Hollos
gigantea (Batsch. ex. Pers.) Lloyd
lilacina (Berk.) P. Henn.
Geastrum arenarium (Lloyd) G. H. Cunn.
australe Berk.
campestre (Morg.) Kambly & Lee
clelandii (Lloyd) G. H. Cunn.
**drummondii* (Berk.) G. H. Cunn.
fenestriatum (Pers.) Fisch.
fimbriatum (Fr.) Fisch.
floriforme (Vitt.) G. H. Cunn.
hariotii (Lloyd) Fisch.
hygrometricum Pers.
limbatum (Fr.) G. H. Cunn.
mammosum (Fr.) G. H. Cunn.
minus (Pers.) Fisch.
mirabile (Mont.) Fisch.

pectinatum Pers.
plicatum (Berk) G. H. Cunn.
rufescens Pers.
saccatum (Berk.) G. H. Cunn.
simulans (Lloyd) G. H. Cunn.
smithii (Lloyd) G. H. Cunn.
triplex (Jungh.) Fisch.
velutinum (Morgan) Fisch.
Astraeus hygrometricus (Pers.) Morgan
Tulostomataceae
Tulostoma albicans White ex G. H. Cunn.
**album* Mass.
australianum Lloyd ex G. H. Cunn.
brumale Pers.
minutum White ex G. H. Cunn.
obesum Cke. & Ell. ex G. H. Cunn.
pubescens G. H. Cunn.
reticulatum G. H. Cunn.
striatum G. H. Cunn.
subfuscum White ex G. H. Cunn.
Battarraea stevenii (Libr.) Fr.
Phellorinia inquinans Berk.
**strobilinia* Kalch. ex Kalch. & Cke.
Chlamydopus **meyenianus* (Klotzsch) Lloyd
Nidulariales
Nidulariaceae
Nidula candida (Peck) White
emodensis (Berk.) Lloyd
Nidularia fusispora Mass.
pisiformis (Roth.) Tul.
Mycocaelia denudata (Fr.) Palmer
Crucibulum vulgare Tul.
Cyathus colensoi Berk.
hookeri Berk.
novae-zelandiae Tul.
olla Pers.
stercoreus (Schw.) de Toni
Sphaerobolaceae
Sphaerobolus stellatus Tode ex Pers.

The list comprises 37 genera and 155 species.

G. Beaton, Eildon, Victoria.
G. A. Crichton, Croydon, Victoria.
Gretna Weste, School of Botany, University of Melbourne.

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Botanical Safari to the Australian Arid Regions
July 2nd — 27th, 1979

A Botanical Safari into the arid regions of Australia is surely an intriguing and interesting expedition but when it is led by Australia's foremost botanist, Dr. J. H. Willis, it becomes a unique and thrilling experience — this was the general acclaim of the eleven men and eight women who took part in this month long camping trip.

Four Toyota four-wheel-drive Land Cruisers, three pulling supply trailers and driven by four versatile and intrepid country men made access possible to trackless lands, most areas of which had received rain in the previous month. Although the rainfall in these regions is notoriously erratic, almost the entire route was within the under 10 ins. (260 mms) annual rainfall area. (See Fig 1).

All mainland States except Western Australia were visited and more than 8000 km. traversed and twenty camps were made. Although in excess of 1200 plant species are recorded in this area, in the short time of the safari, more than 456 native species from 85 different families were collected or recorded. Some were new records for the locality and a few species had never previously been recorded.

Before reaching the first night's camp at Red Cliffs (Vic.) we noted how the orange broom-like *Exocarpus strictus* had spread around the Hattah Lakes area following the bush fires of three summers ago.

North of Wentworth we were almost immediately into the arid zone with salt-bush flats and acacias, here we found the Bramble Wattle *(Acacia victoriae)* which is rare in Victoria and confined to the Warby Range near Thoona, also the Waterbush *(Myoporum montanum)* a close relative of the Boobialla.

Much of our outward and homeward bound routes encircled the Lake Eyre Basin where the elevation is generally below 500 feet (126.6 metres). These areas are underlain by the Great Artesian Basin and we visited the mound springs on its western extremity on the return journey; as most of the terrain is semi-desert scrub, often transected by the parallel lines of tomato-red sandhills, bright coloured flowers were conspicuous by the track side. Near Gairdners Creek our second camp, fields of bright yellow Senecio gregorii were extensive.

Further north in the Fowler's Gap — Lake Patterson area, the bright magenta-pink of the Parakeelya *(Calandrinia)* appeared, 4 species of Calandrinia were collected on the trip — *C. balonensis* common in the Centre, *C. eremaea* the small variety, *C. Ptychosperma* from the mud flats and *C. remota.*

Around this area the Eremophilas (Native fuchsias) began in profusion with their bright red, orange or blue flowers — a total of 15 different species were seen on the trip. — Surely these are some of the most typical and beautiful plants of the arid regions, belonging to the Myoporaceae, some had blue or violet tubular flowers more than an inch long. *E. maculata* with the spotted throat is known to be poisonous as stock-feed.

Another noted stock poison is the Gidyea Acacia *(A. georginae)* (Fig. 2) which appeared north of Tibooburra, in the Sturt National Park area. This tree produces a fluoroacetate akin to 1080, but is not poisonous in all localities; the area of the Georgina River, west of Boulia is one of the poisonous zones. The flowers of the gidyea smelt like boiled cabbage, and the leaves when wet, had a uriniferous odour. We recorded 29 species of acacia, the most unusual of which were the Waddy Trees *(A. peuce)* near Boulia which somewhat resembled a pine-tree with spiny, curling pods.

The Land Cruisers had no difficulty in crossing Cooper's Creek which was about 100 yards wide, and we visited the Nappa (sandhill) Merri (water) Water Hole beside which stands the Coolibah *(Eucalyptus microtheca)* engraved with the words, "Dig 40 feet West — December 16th 1860" which is becoming covered with the rounded healing growth of the bark. It is 119 years since Brahe inscribed the message, and left the area at 10 a.m. not realizing that the malnourished and exhausted King, Bourke and Wills would stagger to the spot some eight hours later and believe they had been deserted. This disappointment finally sealed their doom.

It was all very silent and lonely, apart from a flock of pelicans on the Water Hole when we arrived; the dark green tangled lignum *(Muehlenbeckia cunninghamii* a Polygonum) grew luxuriantly on the banks. Also there grew *Marsilea drummondii,* the Nardoo, the sporocarp or fruiting body of which was ground for flour by the aborigines. Near the Dig Tree was another Coolibah carved with an effigy of Bourke by some workers from Innamincka Station some 15 years after his visit.

The Dig Tree is in Queensland, and we followed the Cooper some 17 miles to Innamincka in South Australia, just as Bourke

Fig. 1. Botany Safari, 2nd July, 1979.

and Wills had done before they gave up hope and died near the river.

The Strzelecki Creek joins the Cooper here and the river flats were covered with Corellas making their feeble protesting cries, we saw these birds again in millions at Birdsville, 200 miles to the north, and heard their cries until midnight as they jostled for positions on the River Red Gums *(Eucalyptus camaldulensis)* along the Diamantina River. Bauhinia cunninghamii the camel tree with twin-leaves, a member of the Caesalpiniaceae grew near the Cooper.

Near the Cooper we found the large blue flowers of Trichodesma zeylanicum. Later we found *Halganea cyanea,* another blue member of the Borage or Forget-me-not family, but the introduced Patterson's Curse

(Echium lycopsis) was not in flower. Another Borage in flower was *Heliotropium tenuifolium*.

In addition to the Coolibahs in this area there were bloodwoods *(Eucalyptus terminalis)*. In the Western MacDonnell Ranges these trees are covered with knobbly "apples" or galls caused by an insect. We were able to cut these open and eat the internal "coconut" layer which encapsulates the large, fat, edible larva looking so repulsive and grub-like that we were not inclined to eat it as the aboriginals do.

Across Sturt's Stony Desert there was little vegetation amongst the gibber stones which remain after the lighter material has all blown away, except a neat red stemmed *Euphorbia tannensis* (also on the island of Tanna in the New Hebrides). Members of the Chenopodiaceae in this area were the blue salt bush now called *Maireana* (formerly Kochia) with rosy-red fruits — in all we found 4 species in addition to 7 species of the salt bush *Atriplex;* 2 species of *Arthrocnemum* (the Glassworts), 8 species of Bassia many with sharp spreading spines, and the Buck-bush or Roly Poly *(Salsola kali)* which sped along in the wind.

Our first *Ptilotus* (pussy-tails) were seen here. These are a feature of arid Australia, and we later found at least 10 species of these Amaranths with green, pink and magenta inflorescences.

Fig. 2. *Acacia georginae*. Photo M. Doery.

Fig. 3. *Casuarina decasneana*. Photo Author.

On an enormous red sandhill on Cordillo Downs, we found a gnarled, spiny tree, the rare *Codonocarpus ramulosus*, one of the Gyrostemons or Bell-fruit trees. The Desert Poplar *(Codonocarpus cotinifolius)* was common in the South Western MacDonnell area (Fig 3) and is a bright green tree with the top curving over heavy with fruit, which grows so quickly near Ayer's Rock. On the same sandhill we saw yellow flowered broom-like bushes of *Crotalaria dissitiflora* as well as the yellow-green flowers of the rattle-pod *C. cunninghamii*. We collected four species of crotalaria.

The Papilionaceae (Fabaceae) family provided us with more colour throughout the entire trip — 5 species of red or violet-red swainsona peas; and on the Sturt Highway north of Alice springs with the brilliant red pea flowers of Brachysema chambersii creeping out from the base of the small spiny bush; later near William Creek with Clianthus speciosus the Sturt Desert Pea. We also enjoyed the patches of waving Psoralea which we saw in several areas. Between Birdsville and Boulia we found the Native Plum *(Owenia acidula)* one of the Meliaceae family to which belongs also the South African White Cedar *(Melia azedarach)* so common as street trees in West Queensland towns.

West of Boulia we crossed the Georgina River which is also known as Rankin's River, Eyre Creek and Mullegan's Creek on its journey south. Here we found a mistletoe, *Amyema miraculosa* growing on another mistletoe which in turn was growing on an eremophila. The Tropic of Capricorn was crossed here and we noted clumps of Mitchell grass *(Astrebla pectinata)* and the pretty pink *Frankenia muscosa* and *F. speciosa*. Another Gramineae which intrigued us was the ginger oil grass *(Cympopogon obtectus)* and a strongly lemon-scented grass found mainly near the Centre.

In the Western MacDonnell's the love grass (Eragrostis eriopoda) appeared to have its base set in a mass of small cotton-wool swabs; the porcupine grass or spinifex *Triodia basedowii* and *T. pungens* seemed ubiquitous.

Near Boulia we found our first flowers of the yellow hibiscus *(Abutilon leucopetalum)* and the pink *Gossypium australe*, with hairy leaves and flowers, a close relative of the Sturt's Desert Rose *(G. sturtianum)* the floral emblem of the Northern Territory. In many areas the perfume of the abundant white and lilac native stocks, was discernible without alighting from the cars.

Our first camp in the Northern Territory was on Tobermory Station near the Queensland border, and although we were technically within the tropical zone, there was a frost overnight and the water in a dish left outside turned to ice. Eastwards along the so-called Plenty Highway the *Gidyea acacia* gave way to mulga *(Acacia aneura)* and the bluish round-leafed mallee *(Eucalyptus gammophylla)* appeared. Here we passed through an area of *Acacia validinervia* which looked like dwarfed golden wattle.

Thirty Red-tailed Black Cockatoos flew along side us for a distance at 50 km per hour as we approached the Harts Range. Here a plant with a distinctive bright orange petal turned out to be a violet *(Hybanthus enneaspermus)*. We camped that night near a bean-tree *(Erythrina vespertilio)* the leaflets of which are shaped like the wings of a bat. The sand sparkled in the rays of the setting sun, and we were soon crouched down collecting handfuls of tiny rubies and garnets. Here there were clumps of intensely purple *Stemodia viscosa*, and a deep blue-purple snapdragon-like flower with scented foliage, both members of Scrophulariaceae family. On the homeward journey near William Creek another member of this family, *Peplidium muelleri*, provided a sky-blue carpet of flowers for hundreds of yards.

At our next camp near Mt. Freeling N.W. of Alice Springs, the beautiful crimson *Grevillea wickhamii* was in flower, and yellow figs covered an enormous *Ficus platypoda* tree. Here we met the caustic vine, *Sarcostemma australe* an Asclepiad, which we later found climbing up into a bloodwood tree in the George Gill Range. Brilliant white trailing inflorescences of *Diplopeltis stuartii* of the Sapindaceae family were found, also dried fruits of the native orange *Capparis mitchellii*, and the native passion fruit *C. spinosa*.

Dr. Willis had previously found a bush of *Euphorbia sarcostemmoides* in this vicinity, and set out to rediscover it, but to his surprise we found many such plants there, and later more at Mt. Sonder and Ormiston Gorge. This succulent leafless spurge is closely akin to some African species, and somewhat resembles the caustic bush.

We were in the land of the Corkwoods, those thick-barked hakeas which have a special significance for the Aborigines because their ritual Kadaitcha murders must be committed within sight of such a tree. We found at least 3 species, *Hakea cyreana* (formerly *divaricarta), H. chordophylla* and *H. suberea*. A day at Mt. Freeling supplied us with 134 species of flowering plants from 44 families.

Next we erected our tents in the Greenleaves Caravan Park at Alice Springs and spent the afternoon at the Arid Regions Herbarium. Next day we explored the gorges in the MacDonnells east of Alice. These mountains extend for more than 200 miles in a W.E. direction across the Centre and were originally estimated to be elevated 10-1500 feet above the surroundings, but have been worn down over the last 500 million years so that the tallest remaining are Mt. Zeil 5000 feet, Mt. Sonder 4500 feet and Mt. Conway 4100 feet, all in the Western sector.

The most spectacular plant in the Eastern gorges was *Pandorea doratoxylon* of the Bignoniaceae family, whose creamy flowers were in profusion over the red rocky walls. At Corroboree Rock there was an attractive blue *Scaevola ovalifera* a fan flower, member of the Goodeniaceae family, also we found a striking white member of this family, *Goodenia horniana*, named after the Horn expedition of 1894. A white *Samolis valerandii* a member of the Primulaceae grew in profusion in Emily Gap along with a purple daisy bush *Olearia stuartii*, and blue *Isotome stuartii*.

After a night of sub-zero temperatures at Alice Springs, two pied butcher birds in the mulgas above our tents turned towards the sunrise and lifted their beaks to sing a long and varied melody. We set off for the Western MacDonnells and probably our most exciting botanical find was at Simpson's Gap only 22.5 miles west of Alice Springs, where high up on the eastern steep, rocky talus of the gorge, the only known occurrence of *Ricinocarpus gloria-medii*, (the Glory-of-the-Centre) grew profusely. This magnificent member of the Euphororbia family (of which there are 15 species only in Australia, 10 of these in Western Australia) had escaped detection until 1966 when Flora McDonald of Melbourne discovered the bushes — but it was not until photographs and material were forwarded in 1972 by Mr H. Alan Morrison also of Melbourne, that Dr. Willis was able to describe and name the species. The flowers resemble orange blossom, and the plants are either exclusively male, or the inflorescence consists of a single, longer stalked female flower surrouned by 1-4 shorter stalked male flowers.

Our next two day camp at Ormiston Gorge yielded 238 different species including 6 new occurrences for that locality; *Petalostylis labicheoides* a close relative of the cassias, showed its yellow petals with the scarlet markings in the centre, and there was a most annoying little yellow *Merbelia viminalis* whose spines caught in our clothing; *Eucalyptus socialis* the red mallee was noticeable here.

At the next camp most of the party made

the strenuous climb to the summit of Mt. Sonder and were successful in obtaining specimens of *Leucopogon sonderensis*, the only member of the heath family (Epacridaceae) in the Centre. This grows only above 100m. and was previously mistakenly referred to as a *styphelia*, until its true identity was established by Dr. Willis.

From a camp near the Finke River east of Hermannsburg we visited Palm Valley to see again the palms *Livistonia mariae* which were discovered by Ernest Giles in 1872 and occur nowhere else but in these damp gorges. Apparently they and other Livistonias in West Australia, North Queensland and even Victoria (Cabbage Tree Palms) are a relic from tropical times when the Australian land mass was joined with the continents of Antarctica, Africa and South America to form ancient Gondwanaland. Another relic of these ancient days are the Cycads *(Macrozamia macdonnellii)* whose nuts are eaten by aboriginals after soaking in water to remove the poison which affected the unsuspecting sailors on Captain Cook's first voyage to Australia.

Next day we followed a track to Gosse's Bluff a geological feature probably formed by the explosion millions of years ago, of a large quartzite bubble, and not by a meteorite as is popularly imagined. Here we found the only *Xanthorrhea* represented in the Centre. *X. thortonii* a rather sad-looking small grass-tree; a small relative of the grass-tree grew in Ormiston Gorge *(Lomandra patens)*.

Some 50 miles west of the George Gill range we came on some quite astonishing fields of pink and white *Thryptomene maisonneuvii* and patches of yellow *Micromyrtus flaviflora;* another member of the family Myrtaceae the *Baeckea polystemona* was later found at King's Canyon.

In this remote western sandhill country the variety of flowers was enormous; we drove through plains of pink *Helichrysum davenportii* and scented wild stocks. In all we found seven species of *Helichrysum* and seven species of *Helipterum*, as well as some showy patches of *Myriocephalus stuartii* the "poached egg" daisy. I found a bush *Swainsona* Sp. which grew like a half-open umbrella planted point down in the sand, with lacy branches and purple pea flowers. We also met some aboriginals who had just captured three wild dromedaries which they were hoping to sell in Alice Springs for $200 each.

Just east of King's Canyon in the George Gill Range is Reedy Rock Pool where we camped for the next three nights. Here we saw the Skeleton Fork-Fern *(Psilotum nudum)* its only occurrence in the Northern Territory. The same plant is found at Mitre Peak and Mt. Arapiles in Victoria. In this vicinity there are numerous caves in the red rocks, some decorated with aboriginal art. At Kathleen Springs a few miles eastwards, we found a small attractive pink member of the Convolulaceae family, rejoicing in the name of Bonamia rosea. A large orange "armour-plated" centipede about 8 ins. long also found and bit me — later in the Wallara Ranch Museum we saw a large jar full of the formidable creatures.

Where the red sandy road verges towards the Sturt Highway was a botanical delight, and we particularly admired a large specimen of weeping Desert Oak *(Casuarina decasneana)* and a field of bright lilac *Solanum* Sp. *Cassias*, of which we found 12 species, were in full bloom. We visited the Henbury Meteorite Craters which are believed to have been formed some 4,700 years ago when one meteor on a high trajectory from the north west, struck the earth and disintegrated into at least another twelve fragments which formed the smaller craters.

The bitumen sealing of the Sturt Highway ceased at the South Australian border and we were thankful to turn off in a south easterly direction towards William Creek where some of the most exciting fields of wild flowers were seen; these included the sky blue *Peplidium muellerii*, the bright blue storksbill *(Erodium crinitum)*, crimson *Clianthus speciosus*, yellow *Calocephalus platycephalus*, pink *Helichriysum cassinianum* and magenta *Ptilotis helipteroides*.

The road south of Oodnadatta became flatter with limestone ridges, limestone "puffs" and gidyea acacias and we made camp on a pebbly gravel area on which grew clumps of lignum. We noticed the spread of the bright green Turkish Wild Turnip in this area. Further south we entered sandhill country again, and the track wound through fields of purple and dark red Swainsona stipularia. The road around Lake Eyre South was a "horror stretch" of ruts and dust, with the only vegetation being salt bush and samphire. Our next camp at Aroona Dam near Leigh Creek was the only truly wet one; rain continued throughout the Flinders Ranges and the slithery yellow mud roads north of Wilpena Pound were difficult to negotiate. Our next camp was at the southern end of the Flinders Ranges in the shadow of Mt. Remarkable near Melrose where giant *Eucalyptus camaldulensis* lined the banks of the creek in true Hans Heysen fashion. Our last camp was on the Murray River flats at Mildura.

At a private aboretum owned by Mr Curtis, "Wilga Park" at Piangil we had our last

review of many specimens of inland flora and the arid terrain. We also witnessed the female emu sitting on her next of eggs, contrary to the traditional theory.

We returned to Melbourne after a strenuous but exhilarating 28 days of botanizing in the arid lands; by popular acclaim the species name allotted to our leader Dr H. H. Willis was "exaltatus", while to most of the other male botanists "griseopogon" seemed appropriate. At the end of the safari the species name "albicans" would have been definitely a misnomer for any of us.

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E. K. Turner.

Naturalists of Yesteryear

BY R. SIMMONS

Possibly the most obvious section of today's Australian wildlife is the Avifauna. This was also obviously true in the late 1880's as well, if gauged by the number of bird-related articles appearing in volumes IV and V, of "The Victorian Naturalist".

* * *

In the December 1887 issue (Volume IV, pages 121-123) an article by Mr A. Coles discusses the need for government protection of various bird species. He says " I think all will agree that some of our birds need protection, particularly edible birds, such as turkey, swan, duck, plover, pigeons, quail etc., otherwise they would be slaughtered all the year round for market." He continues: "Our insectivorous birds should certainly be accorded some measure of protection, as they do a very great service to our fruit-growers and farmers, and the only question appears to me to be — what is the best method to adopt?" Mr Cole then states what he considers to be the main threats to our avifauna: "The greatest enemies to all birds are those who are reported to say 'It is a fine day; let us go out and kill something' and indiscriminate collectors of birds' eggs. It is a well-known fact that boys in the country are in the habit of taking every egg they can possibly find, stringing them into skeins, and hanging them about their homes . . ." His very far-sighted answer to these problems is "to bring the matter before the children of the country State schools, showing them the injury they are doing to their parents, and eventually to themselves, by destroying the natural enemies of their insect pests."

* * *

On the 12th March 1888 a Mr R. H. Nancarrow presented a paper entitled "Note on the Nidification of the Chestnut Rumped Acanthiza (*Acanthiza uropygialis*)." In it he describes his search for the Chestnut Rumped Thornbill (A. uropygialis), "about twenty years ago I used to do a good deal of nest-hunting in the Whipstick . . . In and around the scrub I met with several species of birds, respecting the nidification of which Gould's recently-published handbook furnished little or no information. To search for their nests was therefore, a very pleasurable task." Mr Nancarrow continues "among those that principally engaged my attention were the cautious Hylacola (*Hylacola cauta*), Lambert's Malurus (*Malurus Lamberti*), the Red-capped Robin (*Petroica goodenovii*) and the Chestnut Rumped Acanthiza. I found the nests of all, except Acanthiza uropygialis." The nests of A. uropygialis proved illusive "until the summer of 1881," when, "now I could see how I had hitherto been baffled, for the nest, instead of being placed among foliage, as one would expect an Acanthiza's nest to be, was actually built in the *cleft of a hollow tree.*

"In this case the nest was about 7 ft. from the ground, in a dead, hollow sapling which was cleft on one side." The paper continues "since then I have found three other nests. One was built in a hollow stump . . . the second was built in a hollow, dead branch . . . the third I found, as in the preceding instance, was in an upright dead branch."

* * *

A note, entitled Hummingbird and Mantis, that appeared in "The Victorian Naturalist" (Vol. V page 88) was extracted from the Proceedings of the Elliott Society and "tells a strange tale of a humming bird". It tells of a Mr Alexander who "heard in his garden what

he knew must be a cry of pain, and going to a vine, from which the cry seemed to proceed, he found a humming bird struggling violently but unable to extricate itself. He took it in his hands, and, to his astonishment, saw that it was in the clutches of an insect, . . . a mantis." Mr Alexander states that "the bird was wounded under the wing, upon one side of the breast, which had evidently been lacerated with the powerful mandibles of its captor. The wound looked ugly enough to lead me to fear that it would prove fatal." After releasing the injured bird and tending to its wound it was "placed among the leaves of the vine" but "in the morning the little sufferer lay dead on the ground beneath."

* * *

This final extract is not related to the general theme of this "Naturalists of Yesteryear" column, but refers instead to the King Island Excursion Report detailed in the January/February issue. In a letter to the "Editor of the Victorian Naturalist" entitled "King Island" a Mr Walter K. Bissill says: "Sir — Reading in your journal the interesting account of the exploration of King Island, I have wondered whether it could not be utilised as a zoological reserve for the famous Tasmanian hyena and *Ursine dasyure* (Tasmanian devil). These animals, the most remarkable living carnivorous representatives of an ancient race, are found in no other place in the world except the fastnesses of our sister island and colony, Tasmania, and will in time go the way of all wild beast flesh, before the advancing tide of civilisation.

"King Island is, no doubt, a bit severed from Tasmania, but entirely resembles it in fauna and flora. In it the animals would live on the wallabies, and as a poisonous plant prevents the stocking of the island with sheep and cattle, they could not do much harm.

"Well, almost alone in the earth, we possess living representatives of this wonderful order, the vanguard of the mammal race. Nowhere are there such large carnivorous members as those in Tasmania. They are not only early in time, but in organisation — a link between the lizards and the mammals of Europe.

"They carry what may be called portable nests, with food supplies laid on, being born almost as undeveloped as eggs, and remaining unconscious in the nest (pouch) for weeks.

"Might not the larger of these — the hyena — be allowed a home in an island which is almost useless, except to naturalists."

It is a pity that the effort of the Victorian Naturalists' Club and Mr Bissill's suggestion could not have been acted upon and saved "the famous Tasmanian hyena" from extinction.

NOTE: *Ursine dasyure* is now *Sarcophilus harrisii.*
Hylacola cauta is now *Sericornis cautus.*

The Origin of Generic Names of the Victorian Flora

Part 2 — Latin, Greek and Miscellaneous

(Continued from page 32 in a previous issue)

By James A. Baines

***Symphytum.** Gk name, symphyton, in Dioscorides for two plants, so called from their use in healing wounds (symphyo, make to grow together). **S. officinale,* Common Comfrey, is plentiful on roadsides in several districts, but see Willis on the hybrid Blue Comfrey. Comfrey comes through Old French from Lat con-, cum-, with; feruo, fervo, boil; hence conferuo, grow together, heal up; transferred to the plants because of their use in treating wounds.

***Tagetes.** A Mexican genus of 50 species, named by L. after an Etruscan deity, Tages, said to have sprung from the earth as it was being ploughed and to have taught the Etruscans the art of divination. Varieties of *T. patula* are erroneously called African and French Marigolds. Our sole naturalized

species, **T. minuta*, is invidiously known as Stinking Roger! Family Compositae.

***Tanacetum.** Medieval Lat tanazita (from Gk athanasia, immortality; a-, no, thanatos, death). *T. vulgare* is a superseded name for **Chrysanthemum vulgare*, Tansy, the common name being an English corruption of *Tanacetum*. Named from its medicinal use, and its having been eaten at Easter in memory of the 'bitter herbs' of the Passover. Family Compositae.

Taraxacum. Arabic tarasacon, a kind of succory (or chicory); Persian tarkhashqun, wild endive; Latinized as taraxacon in Avicenna (the Arab philosopher and physician Ibn Sena); rendered *Taraxacum* by Weber in establishing the genus in 1780. Victoria has **T. officinale*, Dandelion, and a native species, *T. aristum*, Austral Dandelion. Dandelion is from French dent de lion, lion's tooth, the reason for giving this name being discussed in an interesting paragraph by Gareth Browning ('The Naming of Wild Flowers', pp. 123-4) — he favours, from a number of explanations, the resemblance of the jagged, backward-pointing lobes of the leaf to the fearsome, sharp-pointed and inward-curving canine teeth of the lion. The family of course is Compositae.

Telopea. Gk telopos, seen from afar (tele, far, opsis, view, appearance)' because these large proteaceous flowers are conspicuous from a distance. Victoria's species, *T. oreades*, Gippsland Waratah, is not so spectacular a bloom as the N.S.W. Waratah; its specific epithet means 'found in mountains'.

Tetragonia. Gk tetra, four; gonia, angle, corner; alluding to the 4-angled fruit of some species. Victoria's 2 species are **T. tetragonioides*, New Zealand Spinach, native over a wide area of Australia especially near the sea, formerly known in this country as Warrigal Cabbage (warrigal being an aboriginal word meaning wild), and *T. implexicoma*, Bower Spinach. The former was named *Demidovia tetragonioides* by Pallas in 1781, after Pavel Grigorievich Demidov (1738-1821), traveller, patron of scientists, and founder of botanical garden in Moscow. Thought by Pallas to be 'like *Tetragonia*', it was placed in that genus, as *T. expansa*, by Murray two years later. The specific epithet of Bower Spinach means 'with tangled hair', probably from its scrambling habit of growth. The family is Aizoaceae (Ficoidaceae).

Tetraria. Gk tetra, four; because some species have 4 style-branches. Our sole species, *T. capillaris*, Hair-sedge, is also known as Bristle Twig-rush (it was originally named *Chaetospora capillaris* by F. Mueller, which means fine-haired bristle-seed). It is in family Cyperaceae.

Tetrarrhena. Gk tetra, four; arrhen, male; with reference to the male flowers. Victoria has 3 species, all native, known as different kinds of rice-grass, although one of them, *T. juncea*, is also called Forest Wire-grass or Tangle Grass. (The root arrhen is also found in 2 other generic names of our flora, including **Arrhenatherum*, False Oat-grass).

Tetratheca. Gk tetra, four; theke, box; alluding to the 4-celled anthers. Our commonest species, *T. ciliata*, Pink Bells, was inadvertently omitted from 'Flowers and Plants of Victoria' (Cochrane, Fuhrer, Rotherham and Willis); it was called Pink-eye in Ewart, and the old English name of Black-eyed Susan has also, rather inappropriately, been applied to it. On a label in Maranoa Gardens (all-Australian flora) it is called Love of the Hills. Our 5 other species are known as different kinds of pink-bells. The genus is our sole representative of family Tremandraceae, the others being endemic to W.A. — the type genus *Tremandra* and *Platytheca*.

Teucrium. Gk teukrion, name of the germander (10 species of which are native in Europe), probably given in

honour of Teucer, first king of Troy, who is said to have first used the plants in medicine. Our 3 species, all native, are known as Grey Germander, Forest Germander and Camel Bush. The word germander comes from a corruption of a Gk word meaning ground-oak. Family Labiatae.

Thelymitra. Gk thelys, female, feminine; mitra, head-dress, turban, mitre; referring to the hood of the column in several species. Victoria has 23 species, all known as kinds of sun-orchid, except *T. antennifera*, Rabbit-ears.

Themeda. According to Forskal, who set up the genus in 1775, themed is the Arabic name of *T. triandra*, which is very close to our sole species, *T. australis*, Kangaroo Grass. This grass was placed in *Anthistiria* by R. Brown in 1810, and it was not until 1919 that Stapf transferred it to *Themeda*. J. M. Black places the accent on the first syllable, but most Victorians stress the second.

Thesium. Gk theseion, name of the plant Theseus crowned Ariadne with. Gilbert-Carter says it was the name of a bulbous plant in Pliny. Our sole species, *T. australe*, Austral Toad-flax, is native, but there are 245 species in the world (family Santalaceae).

Thismia. Of unknown origin. This genus of tropical saprophytes, of 25 species, is represented in our flora by one species, *T. rodwayi*, Fairy Lanterns, which is a rare and remarkable plant restricted to damp humus in shaded forest fern gullies, sometimes flowering underneath the litter. There is a very interesting account of this species, as *Sarcosiphon rodwayi*, by Dorothy G. Coleman, in *Victorian Nat. 52:*163 (1936), telling of its discovery near the Derwent estuary and on Mt. Wellington by Tasmanian botanist L. Rodway, described by Baron von Mueller in 1890 as *T. rodwayi*, and its subsequent finding in Sherbrooke Forest. Named by William Griffith, who had been superintendent of Calcutta Garden, and died at Malacca, Malaya, in 1845, *Thismia* may have been derived by him from a medieval Lat word thisma, a vein or gallery of a mine (from the hidden, 'underground' habitat); this word is listed in R. E. Latham's 'Revised Medieval Latin Word-list' (1965). Willis retains it in family Burmanniaceae, but mentions its being placed in a distinct family, Thismiaceae, by Hutchinson.

***Thlaspi.** Gk thlaspi, a kind of cress, the ground seed of which was used like mustard (from thlao, to crush). Our introduced species is **T. arvense*, Penny-cress, so-named from the flat round pods, as are certain other cruciferous plants (pennyroyal however has no reference to coins, being a corruption of a word meaning royal thyme).

Thrixspermum. Gk thrix, hair; sperma, seed; descriptive of the hair-like seeds. Our species, *T. tridentatum*, from 1838 to 1958 in *Cleisostoma* (— 'closed mouth'), was transferred in 1967 by Dockrill to *Plectorrhiza* (— 'twisted root'). The mouth of the inflated lip is narrowed by overgrowing callosities in *Cleisostoma* (see 'Generic Names of Orchids', by R. E. Schultes and A. S. Pease). The common name, Tangle Orchid, is from its habit of growth.

Thryptomene. Gk thryptomene, diminished, made small (from thrypto, to break); alluding to the lowly stature of most of the species. Black, who gives this meaning, places the stress on the second of 4 syllables, but as a common name most Victorians stress the first and pronounce the word in only 3 syllables. Grampians Thryptomene is also known as Bushy Heath-myrtle; our other species, Ribbed Thryptomene, is found in East Gippsland. The genus is myrtaceous.

Thysanotus. Gk thysanotos, fringed (from thysanos, a fringe, tassel); alluding to the 3 inner perianth segments. Our most widespread species is *T. tuberosus*, Common Fringe-lily (a

better name than Fringed Violet, used in N.S.W.), and we have 4 other species, all known as kinds of fringe-lily. The genus is in family Liliaceae.

Tillaea. Named by L. after Michelangelo Tilli (1655-1740), professor of botany at Pisa (Italy). Now synonymous with *Crassula*, all except one of our species of the latter having previously been in *Tillaea*. (Omitted from Part 1, so included here.)

Tmesipteris. Gk tmesis, a cutting or dividing; pteris, fern; from the forking (only sometimes) of the rhachis, hence the name fork-ferns for our 3 species. The genus is in family Psilotaceae, the type genus, *Psilotum*, having its stems repeatedly forked, our species being *P. nudum*, Skeleton fork-fern. *T. parva*, Small Fork-fern, and *T. ovata*, Oval Fork-fern, were described by our late member of F.N.C.V., N. A. Wakefield, in 1944, *Vict. Nat.* 60: 143.

***Tolpis.** Name coined by French botanist Adanson when he established the genus in 1763. He gave no derivation, but possibly based it on Gk tolype, a ball of wool; nevertheless he was prone to invent meaningless names. Our introduced species, **T. umbellata*, is Yellow Hawkweed (family Compositae).

***Torilis.** Another of Michel Adanson's coinages, this time probably based on the Linnaean genus *Tordylium*, which was from tordylion, the Gk name in Dioscorides of *Tordylium apulum*, Mediterranean Hartwort. Our species, **Torilis nodosa* was transferred from *Tordylium* by Gaertner in 1788; its common name is Knotted Parsley or Knotted Hedge-parsley. Both genera are still valid, in family Umbelliferae. (Black calls it Hedgehog Parsley.)

Toxanthes. Gk toxon, a bow; anthos, flower; alluding to the bent corollas. (Toxophilite is an addict of archery.) We have 2 species, *T. muelleri*, Common Bow-flower, described as *Antherocerastes* (— horned anthers) by Sonder in honour of Baron von Mueller, and *T. perpusilla*, Tiny Bow-flower, the specific epithet of which means very weak and slender. Fam. Compositae.

Trachymene. Gk trachys, rough; mene, moon (according to Black) or meninx, membrane (Smith & Stearn); alluding to the appearance of the fruit. Victoria has 4 native species, and there is no common name other than the generic one, although *T. anisocarpa* is sometimes called Wild Parsnip. Our 3 species of *Platysace* were formerly referred to *Trachymene*. These umbelliferous genera are close to each other.

***Tragopogon.** Gk name of goatsbeard, of this genus (tragos, goat; pogon, beard); alluding to the silky pappus. Our species is **T. porrifolius*, Salsify or Oyster Plant, the specific epithet of which means leek-leaved. The swollen taproot is a useful vegetable known as white salsify (— saxifraga, break-stone). Another name for the plant is Purple Goatsbeard. Fam. Compositae.

Tragus. Gk tragos, a he-goat; alluding to the rigid hairs bordering the leaves and to the bristles on the spikelets. *T. australianus* is Small Bur-grass.

Trema. Gk trema, a hole; the reason why Loureiro gave this name is obscure. *T. aspera*, Peach-leaf Poison-bush or Rough Hemp-nettle, is a very rare shrub in Victoria, found only once, at Mallacoota Inlet, but it extends north to Qld. and the Kimberleys, W.A. The genus belongs to family Ulmaceae.

Tribulus. Greco-Latin name of *T. terrestris*, Caltrops, from the resemblance of the spiny carpels to the tribulus or caltrop (calcar, spur; trappa, trap), a military iron ball with 4 sharp prongs used to impede cavalry. The above species is the only one in Vic., but S.A. has 5. It is also known as Goathead Burr, Bindii and Puncture Vine (N.S.W.). The genus is in family Zygophyllaceae, Lat tribulum, threshing sledge, from tribulo, press, oppress (cf. English tribulation).

Trichinium. Gk trichinos, hairy (from

thrix, trichos, hair); alluding to the appearance of the inflorescences. Robert Brown's genera *Trichinium* and *Ptilotus* (both 1810) were first united by Poiret under *Ptilotus* (1817) and then by Sprengel under *Trichinium* (1825). As the differences are minor, all our species, listed under *Trichinium* by Ewart, are now in *Ptilotus*.

Trichomanes. Gk name of a fern mentioned by Theophrastus (from trichos, genitive of thrix, hair; manes, a cup). Victorian ferns formerly in this genus are now in *Asplenium*, *Macroglena*, *Mecodium*, *Hymenophyllum*, *Cheilanthes* and *Polyphlebium*, of 3 different families!

Tricoryne. Gk treis, three; koryne, club; because the fruit is divided to base into 3 one-seeded nutlets. There are 7 species in this endemic Australian liliaceous genus, but Victoria has only one, *T. elatior*, Yellow Rush-lily or Yellow Autumn-lily, the specific epithet meaning higher or very tall.

Tricostularia. Lat tres, three; costula, a little rib (costa, rib); referring to the 3-ribbed nut. Victoria has one of the 3 species of this endemic Australian cyperaceous genus, *T. pauciflora*, Needle Bog-rush.

***Trifolium.** Lat tres, tria, three; folium, leaf; because the leaves normally have 3 leaflets (the rarity of the '4-leaved clover' making it a symbol of good luck, and of Ireland as the Shamrock). There are 300 species, but none native to Australia. Victoria has 20 naturalized species, known as different kinds of clover or trefoil, the latter being an English form of the generic name. Shamrock is an anglicization of Irish seamrog, diminutive of seamar, trefoil; in Scotland clovers are called in Gaelic seamrag.

Triglochin. Gk treis, three; glochin or glochis, barb of an arrow, a projecting point; alluding to the points of the 3 carpels. *T. procera*, Water Ribbons, is the only one of our 8 species not known as different kinds of arrowgrass; its specific epithet means tall, slender, long (Lat procer, an illustrious person), the long narrow leaves resembling ribbons in the water. The ch- should be sounded like k-, not as in church. The genus is in family Juncaginaceae.

Trigonella. Diminutive of Greco-Lat trigonus, 3-cornered, triangular; because of the appearance of the corolla of *T. foenum-graecum*, Fenugreek, this common name being an anglicization of the specific epithet, which means 'Greek hay' — the plant is useful in veterinary treatments. Our introduced species is **T. ornithopodioides*, Birdsfoot Fenugreek, and our native species, *T. suavissima*, Sweet Fenugreek or Menindie Clover. It is a papilionaceous genus.

Triodia. Gk treis, three; odous, tooth; because the flowering glume is divided into 3 obtuse or acute teeth or lobes. Victoria has *T. irritans* and *T. scariosa*, both known as Porcupine Grass and (incorrectly) Spinifex, the specific and vernacular names all referring to the sharp spiny leaves. The genus is in the Danthonieae tribe of family Gramineae.

Tripogon. Gk treis, three; pogon, beard; the flowering glume is 3-nerved, the midnerve protruding as a short awn; the 2 rows of flowers are appressed and beardlike. Our species, *T. loliiformis*, Rye Beetle-grass, was formerly in *Diplachne*; its specific epithet means with the form of *Lolium*, rye-grass.

Triraphis. Gk treis, three; rhaphis, a needle; the flowering glumes are 3-awned. Our species, *T. mollis*, Needle Grass, is called Purple Heads in S.A.

Trisetum. Lat tres, tria, three; seta, bristle; the flowering glume bears a dorsal awn and in some species there is also a short awn on each of the two terminal teeth. Our species, *T. spicatum* and **T. pumilum*, known as kinds of bristle-

grass, have been transferred to *Lophochloa* (— 'crested grass').

Tristania. Named by R. Brown after French botanist, the Marquis Jules M.C. de Tristan (1776-1861), who wrote a flora of the department of Loiret (in central France) and works on general plant anatomy. Victoria's sole species, *T. laurina*, found only in jungle pockets of East Gippsland, is known by the aboriginal name of Kanooka, and sometimes as Water Gum, because of its preference for streamside habitats, such as in Glenaladale National Park near the Den of Nargun, where there are many gnarled veterans. The northern species, *T. conferta*, Queensland Brush Box, is familiar to Victorians as a favourite ornamental tree in streets, parks and schoolgrounds. (Omitted from Part 1, so included here.) The genus is myrtaceous. (The Maori word Kanuka, similar to Kanooka, is the common name of *Leptospermum ericoides*, cf. Manuka, *L. scoparium*. Maori words nevertheless are accented usually, as in both these cases, on the first syllable.)

Trithuria. Gk treis, three; thyrion, a little door (from thyra, thura, door); (English door and German Tur are forms of the same word); alluding to the valves of the fruit. Our species, *T. submersa*, is still known in the vernacular by its former generic name, Juncella; it is in family Centrolepidaceae.

***Triticum.** The classical Lat name for wheat (perhaps from tritus, much trodden, threshing of grain; Eng. trite is a form of the same word—well-worn). **T. aestivum*, Common or Bread Wheat, the specific epithet of which means flowering in summer, has also been known as *T. sativum* and *T. vulgare*. The Eng. word wheat comes from the whiteness of the flour, as does German Weizen; French ble from Low Lat blatum, of unknown origin; but Spanish trigo, wheat, comes from Lat triticum.

***Tritonia.** The author, John Gawler (who changed his name to Bellenden Ker two years later) named the genus in 1802, saying he derived the name from Triton, in the signification of a weathercock, alluding to the variable directions of the stamens. Apparently there were weather-cocks in the form of this minor sea deity, who is depicted, in the train of the sea-god Poseidon (Neptune), as upper half man and lower half fish. Our species, **T. lineata*, is Pencilled Cornflag or Lined Tritonia, and is in family Iridaceae.

Trochocarpa. Gk trochos, wheel; karpos, fruit; the fruit being a berry containing 10 pyrenes. Our species, *T. clarkei*, Lilac Berry, was seen at its best by Native Plants Preservation Society and Botany Group F.N.C.V. on an excursion to the Upper Thomson River, at 3000 feet, March 1975. It is endemic in Victoria between Lake Mountain, Mt. Buller and Mt. Wellington, but there are other species in Tas., W.A., etc. Family Epacridaceae.

Trymalium. Gk trymalia, an aperture (tryma, hole); alluding to the 3 slits at the top of the fruit when it opens. Victoria has 2 species, *T. d'altonii*, Narrow-leaf Trymalium (named by Mueller after St. Eloy D'Alton), and *T. ramosissimum*, Broad-leaf Trymalium. The genus is in family Rhamnaceae.

Turritis. Lat turritus, furnished with towers (turris, tower); name given by L. in 1753, but our sole species is native. *T. glabra*, Tower Mustard or Smooth Rock-cress, is rare, being found only at Cobungra and Mitchell River sources. It is a cruciferous genus.

Tylophora. Gk tylos, a knot, callus, a knob on a club; phoros, bearing. *T. barbata*, Bearded Tylophora, is found in East Gippsland, also in N.S.W. The genus is in family Asclepiadaceae.

(To be Continued)

F.N.C.V. Annual Report 1979/80

This centenary year has been a historic one for the Club with a large number of members involved in the extra activities. The calendar year 1980 is being treated as the centenary year so there are still a number of events still to come. The principal event of the year, the Centenary Meeting was held at the State Film Centre on Monday May 5th in the presence of our Patron, the Governor of Victoria. Dr. J. H. Willis gave the Centenary Address and the evening was generally received as a fitting one to mark the achieving of 100 years of activity.

Other centenary events so far held include a very successful picnic at Whittlesea the day before the meeting and major speakers at general meetings included Dr. B. R. Wilson, Director of the National Museum and Professor Hills from Melbourne University.

Special thanks are due to the Centenary Committee and to the various special subcommittees planning the various events. Major events still to come this year include the Centenary Naturalist due out next month, the Nature Show in October and the Excursion to Wilson's Promontory in November and many others.

Council has operated throughout the year without a Vice-President. Costs have again been Council's chief worry. A further grant towards the publication of the *Naturalist* was received from the State Government. General meetings have continued to attract good attendances with varied programmes. The special interest groups have again functioned well with well attended meetings and excursions.

Active support for various conservation issues was again evident during the year with submissions sent to the Premier and various state and federal authorities. I represented the Club on a deputation to the Minister for Conservation for support for the work of Mr Cliff Beuglohole of Portland.

The bookstall continued to prosper during the year, providing a valuable service to members and a good source of revenue for the Club. This is due to the efforts and enthusiasm of Mr Dan McInnes.

Excursions remain a major activity of the Club with regular day excursions providing a wide range of experiences for members. Besides these our hard working Excursion Secretary, Miss Marie Allender organised longer excursions to Broken Hill (Aug.-Sept.), Flinders Island (Jan.) and Benalla for the F.N.C.A.V. meeting in March and the Strathbogie Ranges with the Hawthorn Juniors at Easter. A new type of excursion was instituted this year by our energetic Secretary, Miss Wendy Clark, the special study trip. These have proved most successful for the slightly more energetic, serious-minded members.

The *Victorian Naturalist* continues its high standard under the editorship of Mr Rob Wallis. A liftout calendar of events for the Centenary Year was published in the January/February issue, thanks to the energy of Miss Madge Lester. At the beginning of the Club year the Subject Index was published. This was well received by a wide spectrum of users and rates as a major achievement for the Club.

The library service to members continued to improve largely due to the energies of the Assistant Librarian, Miss Madge Lester.

The Australian Natural History Medallion was presented to Miss Helen Aston of the National Herbarium by Professor Stubbs, President of the Royal Society of Victoria.

Three people were appointed honorary members during the year — Professor J. Turner, Mr R. Lambrock and Mr N. Lothian.

A new Subscription Secretary, Miss Helen Malcolm was appointed during the year.

Finally I would like to thank Council and all members for their assistance during the year. In particular I would like to thank the retiring Treasurer, Mr Dan McInnes for his untiring work for the Club. His advice on Club matters in general as well as his sound financial guidance has been of incalculable value to the Club.

Thank you

Brian J. Smith
President

(Continued from page 142)

tend on Sunday only can meet at the entrance to the Park at 10.30 a.m. sharp. Details and application forms are available at meetings or from Linday Lumsden 669-9884 (BH); 376-8316 (AH). Bring all camping gear, food and water, hand lens, etc.

Sunday, 18 October. Effects of phytophthera (cinnamon fungus), Brisbane Ranges.

GROUP MEETINGS

All FNCV members are invited to attend any group meetings, no extra charge.
At the National Herbarium. The Domain, South Yarra, at 8.00 p.m.

First Tuesday — Mammal Survey Group

Tuesday, 2 September. Mammals of remnant forest patches in south west Victoria. Speaker: Andrew Bennett.

Tuesday, 7 October. Mammals of Wilsons Promontory.

First Wednesday — Geology Group

Wednesday, 3 September. Palaeontology. Speaker: M. Garrett.

Third Wednesday — Microscopy Group

Wednesday, 20 August. Botanical section cutting, staining and mounting.

Wednesday, 17 September. Polarised light and the interference microscope.

Wednesday, 15 October. Photography through the microscope.

Second Thursday — Botany Group

Thursday, 11 September. Border botany; exploring the more remote parts of Victoria. Speaker: Mr L. Costermans.

Thursday, 9 October. No meeting — preparing for Centenary Nature Show.

At the Conference Room, The Museum, Melbourne, at 8.00 p.m. Good parking — enter from Latrobe St.

First Monday — Marine Biology and Entomology Group

Monday, 1 September. Galls and gall insects. Speaker: Mr U. Bates.

Monday, 6 October. Insect fruit pests. Speaker: Mr D. Harbeck.

GROUP EXCURSIONS

All FNCV members are invited to attend Group excursions.

Botany Group — last Saturday

Saturday, 30 August. Lysterfield area for wattles.

Saturday, 27 September. Property of A. Parkin, Bruce's Creek, Whittlesea.

Saturday, 25 October. Langwarrin and Cribb Point.

Day Group — third Thursday.

Thursday, 21 August. Cheltenham Park (Park Street). Meet in barbecue area, 11.30 a.m. Cars will meet the 10.43 a.m. Frankston train from Flinders St at Cheltenham station. Leader: A. Fairhall. Phone 578-2009.

Thursday 18 September. Wattle Park (Riversdale Rd). Meet at kiosk car park at 11.30 a.m. Wattle Park tram from Batman Avenue, city (10.24 or 10.36 a.m.) to stop 65. Leader: D. Bell. Phone 89-2850.

Thursday, 16 October. Blackburn Lake and Sanctuary. Meet at Lake Rd entrance at 11.30 a.m. Cars will meet the 10.45 a.m. train from Flinders St at Blackburn station. Leader: D. Bell. Phone 89-2850.

Mammal Survey Group

Saturday, 13—Sunday, 14 September. Strathbogie Ranges camp.

Geology Group

Sunday, 14 September. Fossil fish in Gippsland. Leader: Pam Gawith.

Sunday, 12 October. Cape Liptrap.

"A Guide to the Genera of Beetles of South Australia"
Part 1 Archostemata and Adephaga
E. G. Matthews
Sth. Aust. Museum Publication. Key to the Genera 108 Plates
Price $3.30 plus postage

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

Patron:
His Excellency the Honorable SIR HENRY WINNEKE, KCMG, KCVO, OBE, KStJ, QC.

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Geology: Mr. T. SAULT, C/- National Herbarium, The Domain, South Yarra, 3141
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FNCV Kinglake Nature Reserve: McMahons Road, Kinglake.
Bookings and keys: Mr. I. F. MORRISON, 788 Elgar Road, Doncaster (848 1194)

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

Subscription rates for 1980

Metropolitan	$12 00
Joint Metropolitan	$14 50
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Joint Country and Joint Retired	$12 00
Junior	$2 50
Subscription to Victorian Naturalist	$10 00
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Individual Journals	$1 75

All subscriptions should be made payable to the Field Naturalist Club of Victoria and posted to the Subscription Secretary.

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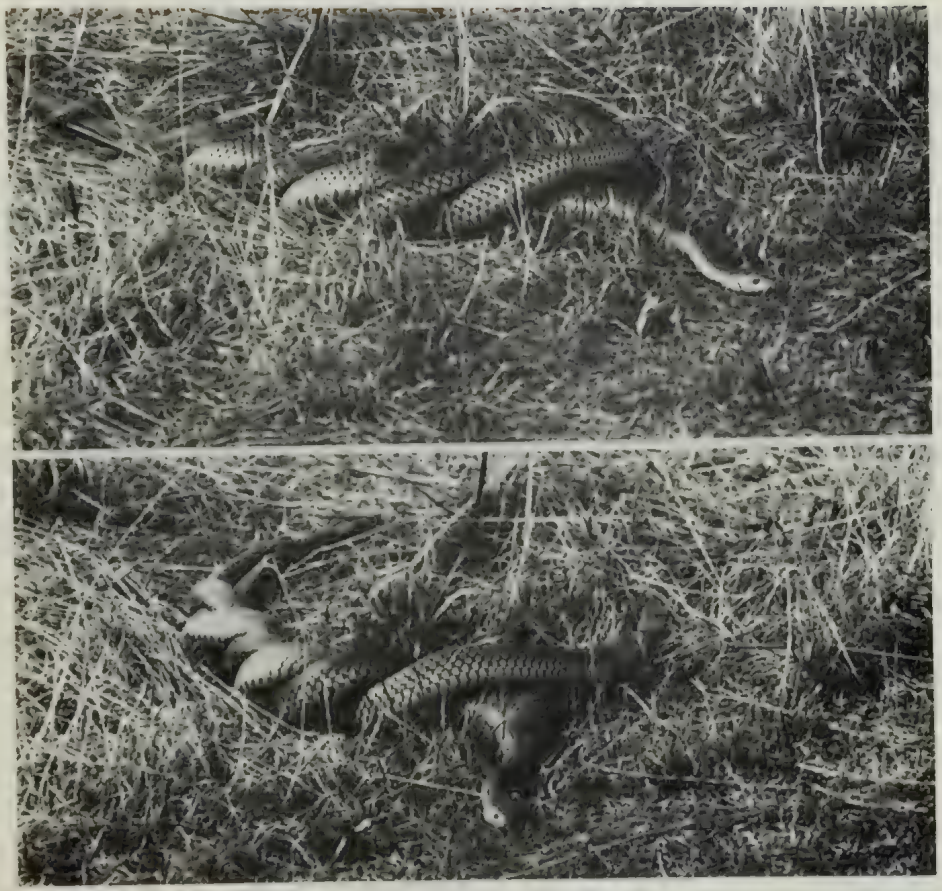

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GENERAL MEETINGS

At the National Herbarium, the Domain, South Yarra.

Monday, 13 October 8.00 p.m.
Wilsons Promontory evening hosted by the Study Groups.

Monday, 10 November 8.00 p.m.
Speaker will be the winner of the 1980 Natural History Medallion.

Monday, 8 December 8.00 p.m.
Programme hosted by the Hawthorn Junior FNC.

New Members — September/October General Meetings.

Ordinary
Robin Bliss, 6/1030 Heatherton Rd., Noble Park.
Richard Fullagar, 328 Danks St., Middle Park.
John Pitcher, 2 Paisley St., Box Hill North.
Neville Winstone, 9/18 Leopold St., South Yarra.

Joint
James and Christine Craik, 15 Higgs Ave., Mill Park.
Animesh and Sumita Ray, 6/36 Albion Rd., South Yarra.
Mr and Mrs T. F. W. Robbins, 1059 Doncaster Rd., Doncaster East.
David Strom and Rhonda Kearley, 1279 Nepean Hwy., Mt Eliza.

Country
Lorraine Cotter, 40 Fyans St., Colac.
David Eagleson, "Gillingall", Buchan.
Patrick Ward, 22 Latrobe St., Newport.
J. Wauchope, P.O. Box 5, Blinman, S.A.
Gary White, P.O. Box N308, Grosvenor St., Sydney.

FNCV EXCURSIONS

Friday, 10 — Sunday, 12 October. Centenary Nature Show in the Lower Melbourne Town Hall.

Saturday, 1 — Saturday, 8 November. Wilsons Promontory.. Details in July/August Naturalist. Contact the Excursion Secretary if further information is required.

Sunday, 7 December. Anglesea area. The coach will leave Batman Avenue at 9.30 a.m. Fare $6.50. Bring two meals.

Preliminary notices:

Saturday, 17 — Sunday, 25 January, 1981. Mt Kosciusko. The coach will leave Flinders St from the Gas and Fuel Corporation building at 8.15 a.m. for Orbost where the party will spend the first night. From Orbost we will travel to the Skyrider Motel in Wilsons Valley where we will stay for the next 6 nights. Saturday 24th January we travel to Corryong for the last night and return to Melbourne on Sunday 25th January. Accommodation is booked on a D.B.B. basis. The excursion, including coach fare, will be $250.00. A deposit of $20.00 should be paid on booking and the balance by the December General Meeting. Check if there are any vacancies before as these have so far been heavy. Picnic lunches will be required.

June 1981. An Arnhemland-Kimberleys Safari run for naturalists by Kingston's Tours in cooperation with the Western Victoria Field Naturalists Clubs Association will leave Stawell on Saturday 6th June for a 23 day tour. Tents and food supplied.
Further details may be obtained from the Excursion Secretary or Kingston's Tours, 23 Wimmera St., Stawell, with whom bookings should be made. Tariff $465, deposit $50 per person. A second safari will be made on September 19th for 15 days visiting the Lamington National Park and Warrumbungles, at a cost of $310.

GROUP MEETINGS

All FNCV members are invited to attend any Group meeting, no extra charge.

There will be no Group meeting for the Marine Biology and Entomology, Mammal Survey and Geology Groups in November because of the Centenary Camp.

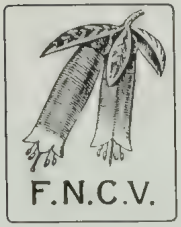
At the National Harbarium, the Domain, South Yarra, at 8.00 p.m.

First Tuesday — Mammal Survey Group.
Tuesday, 2 December. Discussion and preparation for the Christmas camp. Mr M. Fleming will speak on the fauna survey in Arnhemland.

First Wednesday — Geology Group.
Wednesday, 3 December. Members' night.

Third Wednesday — Microscopy Group.
Wednesday, 15 October. Photography through the microscope.
Wednesday, 19 November. Movie photography through the microscope.
No meeting in December.

(Continued on page 226)



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Cover illustration: Presumed male combat in the copperhead, *Austrelaps superbus*

Ritual Combat in the Australian Copperhead, *Austrelaps superbus (Serpentes, Elapidae)*

BY RICHARD SHINE[1] AND SALLY ALLEN[2]

The copperhead (*Austrelaps superbus*) is a large (up to 1.5m) venomous terrestrial snake of south-eastern Australia. In this paper, we provide the first record and photographs of presumed male combat in this species. The observations were made 6 km south of the town of Mortlake, Victoria (142° 50′E 38° 05′S). The exact date was not recorded, but the observations were made in September or October 1978. Several observers watched the snakes; we thank Mr J. R. Allen for the photographs and description.

The snakes were first seen at about 1200 hrs, in a cleared pasture among tussock grass. The nearest permanent water was a man-made dam about 200m away. The snakes were entwined along the posterior parts of their bodies when initially sighted (Fig. 1). Both copperheads were large, about 1.5m in total length. They would lie quietly for a minute or two, and then move rapidly, writhing about and striking at each other. At these times, their heads would be raised up to 20cm off the ground. Although the snakes snapped at each other, no prolonged "chewing" bites were seen. Neither snake reacted to the approach of an observer within 3m. The posterior parts of the snakes remained entwined during the entire period of observation (> 30 minutes). The snakes finally separated and moved away when they were pelted with stones by a group of people. No other copperheads were sighted in the vicinity of the two entwined snakes.

Although the snakes were not collected and sexed, we are confident that they were adult males in ritual combat. We base this interpretation on the body sizes of the snakes, as well as their behavior. Male copperheads grow to much larger body sizes than do females (Shine, 1978 a, b). The similarity in body sizes of the two "combatants" indicates that they were both of the same sex, and their large size suggests that both were males. Further, the postures adopted by the two snakes (Fig. 1) were similar to those seen in ritual combat between adult males of other elapid and colubrid species (e.g. Bogert and Roth 1966). The behavior of mating snakes is very different; both partners are passive during copulation, and their bodies are not entwined (e.g. Bogert and Roth 1966).

One unusual feature of *A. superbus* combat is the tendency for only the posterior parts of the bodies to be entwined; the heads of the snakes may be quite distant from each other (Fig. 1). This phenomenon has been reported previously in only one species, the Madagascan boa *Sanzinia madagascariensis* (Carpenter *et al.*, 1978). Entwining of only the posterior part of the body has been interpreted as an adaptation to arboreal combat in *Sanzinia* (Carpenter *et al.*, 1978), but the same hypothesis certainly cannot explain this behavior in *Austrelaps*. The copperhead is completely terrestrial.

Little information is available on reproduction in Victorian copperheads. Shine (1977 a, b) has described reproductive cycles in northern *A. superbus*, but Rawlinson (1974) suggested that this "highlands" form is a different species from the "lowlands"

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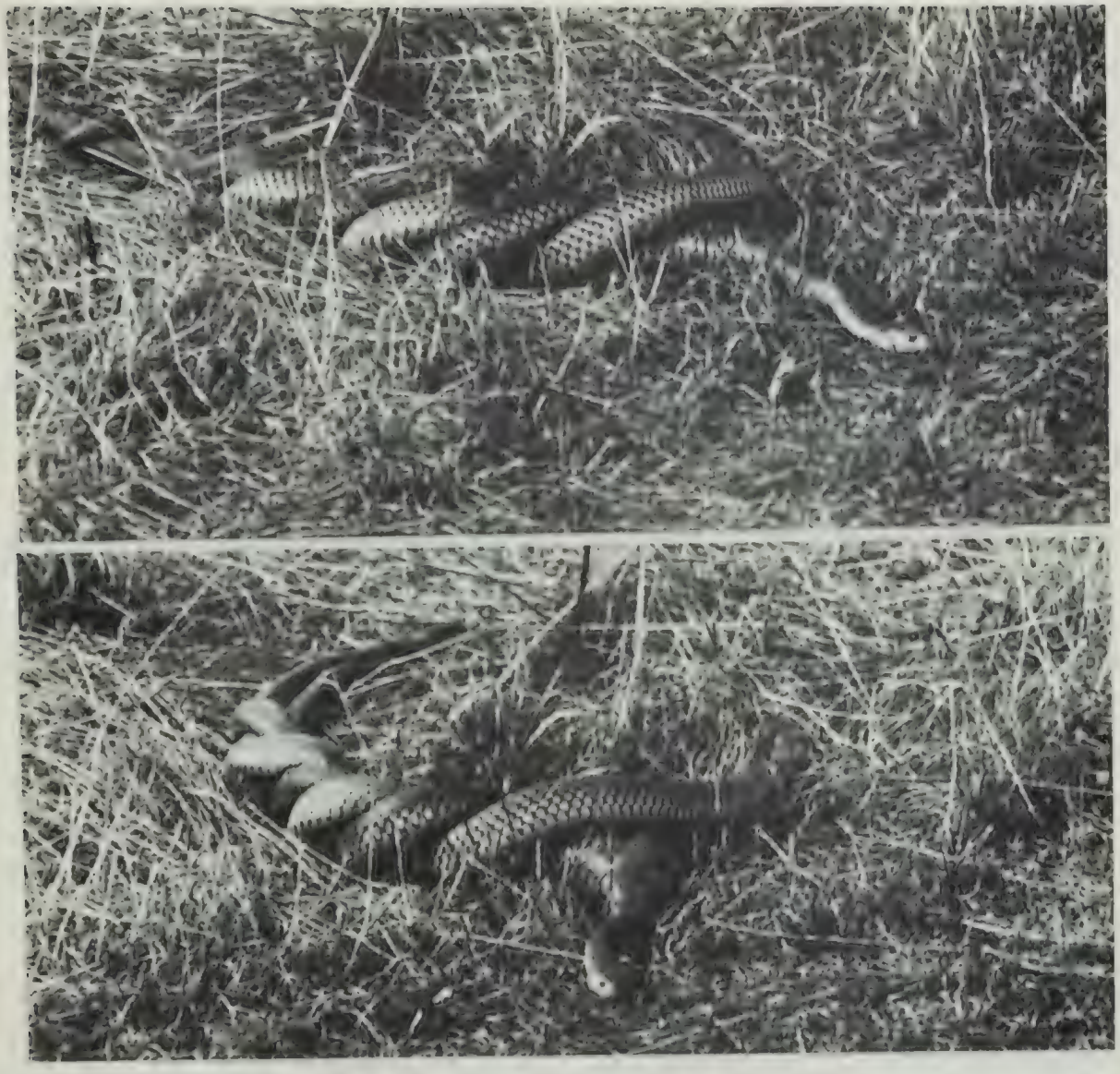

Fig. 1. Presumed male combat in the copperhead, *Austrelaps superbus*.

Victorian copperhead. The timing of the present record of male combat (September - October, the Australian spring) is consistent with the autumn and spring mating season of the "highlands" copperhead (Shine, 1977a). Male combat in snakes occurs most often during the mating season (Bogert and Roth 1966).

Ritual combat between males has now been documented in Australian snakes of the boid genera *Liasis* (Ross, 1978) and *Morelia* (Covacevich, 1975), and the elapid genera *Austrelaps* (present study), *Cryptophis* (N. Charles, pers. comm.), *Demansia* (Shine, unpublished data), *Hemiaspis* (A. Easton, pers. comm.), *Notechis* (Shine 1977a), *Oxyuranus* (Hosmer, 1953, Worrell, 1963), *Pseudechis* (Fleay, 1937, 1951; Baker, 1968; Shine, 1977a, Shine *et al.*, unpublished data) and *Pseudonaja* (Fleay, 1937). Combat is more common, or at least more often noticed, in some species than in others. Combat bouts have been recorded more often in the common black snake (*Pseudechis porphyriacus*) than in other Australian elapids. For example, Fleay (1951) described black snake combat while noting that he had never seen male combat in either tiger snakes (*Notechis*

scutatus) or copperheads, two species with which he had great experience. Similarly, Shine (1977a) noted three cases of combat in New England black snakes, but none in tiger snakes or copperheads in the same area. Subsequent records of male combat in both *Notechis* and *Austrelaps* (Shine, 1977a; present paper) show that combat does occur in these species but is less common or less noticeable than in *Pseudechis porphyriacus*. Cases such as these suggest that male combat behavior may be much more widespread among the Australian snake fauna than is currently realized.

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New Records of Scincid Lizards from Victoria

BY A. J. COVENTRY[1] AND P. ROBERTSON[2]

Rawlinson (1971) listed the species of reptiles then known to occur in Victoria. Coventry (1976) described a new species of skink, *Hemiergis millewae*, from the far north west of the state. This article records the presence of two more species of skink in Victoria.

1. *Sphenomorphus kosciuskoi* Kinghorn, 1932. Alpine Water Skink. (Fig. 1).

Description:

A medium-sized lizard with a maximum snout-vent length of 80 mm (Cogger, 1979). Ground colour of back dark brown, with a prominent black vertebral stripe from the nape extending on to the tail. A pale dorsolateral stripe, edged above and below by black, from above and behind the ear to the groin. Flanks lighter, speckled with black; belly light with dark flecks.

Sympatric species with which it is most likely to be confused are *Sphenomorphus tympanum* and *Leiolopisma entrecasteauxii*. It can be distinguished from the former by the presence of the dark vertebral stripe and from the latter by its scaly lower eyelid. *S. tympanum* lacks the vertebral stripe and *L. entrecasteauxii* has a transparent window in the lower eyelid.

Distribution:

Cogger (1979), shows that the Alpine Water Skink occurs in a number of isolated populations, extending from the "Mt. Kosciusko region of the Australian Alps to northern tablelands of New South Wales".

The first Victorian specimens were collected from several localities on the

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Fig. 1 *Sphenomorphus kosciuskoi*, Davies Plain Creek.

Fig. 2 Habitat of *Sphenomorphus kosciuskoi* at Davies Plain Creek.

Davies Plains in north-eastern Victoria, during field research being undertaken by the National Museum of Victoria for the Land Conservation Council of Victoria (L.C.C.) in January 1975. These localities were Charlie Creek, 36° 46' S: 148° 05' E., (N.M.V. No. D42060), Davies Plain Creek, 36° 38' S: 148° 07' E., (N.M.V. No. D42073), and King Plain 36° 40' S: 148° 06' E., (N.M.V. No. D42203). In November 1976 an additional specimen was collected from The Playgrounds in the Cobberas, 36° 53' S: 148° 07' E., (N.M.V. No. D48557). All these localities are within a predictable extension of the southern range of this species. However, it is surprising that, despite fairly extensive searching, *S. kosciuskoi* has not yet been found at other likely Victorian localities, such as Mt. Bogong or Mt. Hotham.

Habitat:

(Fig. 2). *S. kosciuskoi* is restricted to alpine areas; all the Victorian localities are above 1400 metres within the cold temperate Bassian region, as defined by Rawlinson (1971). It is very specialized in its habitat requirements, being restricted to the sphagnum mossbed-heath association found along drainage lines and similar wet areas.

Of utmost importance for the conservation of *S. kosciuskoi* is the preservation of its delicate and specialized alpine habitat. The L.C.C. in its final recommendations for the alpine area (1979) included all the known Victorian localities for this species within the proposed Cobberas-Tingaringy National Park. While this would appear to give *S. kosciuskoi* some form of protection, the L.C.C. also recommended that grazing be permitted within this proposed park (p.13). The same recommendations on page 72 stated: "The drainage lines that once contained moss beds are often used by cattle in search of water and palatable herbaceous vegetation. This results in trampling of these easily damaged wet areas which impedes their recovery or even causes renewed deterioration." It would appear, therefore, that if grazing is permitted within the proposed Cobberas-Tingaringy National Park, the preferred habitat of *S. kosciuskoi* will be at risk, and the continued survival of this species in Victoria will be in doubt.

2. *Egernia multiscutata* Mitchell & Behrndt, 1949. (Fig. 3).

Description:

A medium sized skink with a maximum snout-vent length of 94 mm (Storr 1968). Dorsal ground colour light brown to fawn. A dark paravertebral stripe, on each side of the body, each stripe enclosing a series of longitudinal lighter spots, commencing at the nape and extending to the base of the tail. Flanks lighter brown to grey, usually with light flecks.

Belly immaculate, cream to light grey, often tinged with salmon in adults. Juveniles generally much darker, with more distinct patterning.

This species is a member of the *Egernia whitii* group of skinks (Storr 1968). Two other members of this group also occur in Victoria, *E. whitii* and *Egernia inornata*, both of which could be confused with *E. multiscutata*. *E. whitii* has the interparietal scale much narrower than the frontal and the subdigital lamellae have one sharp keel (unicarinate), whereas in *E. multiscutata* the interparietal is almost as wide as the frontal and the subdigital lamallae have two sharp keels (bicarinate). *E. inornata* lacks the paravertebral lines, the dorsal surface usually being speckled with black.

Fig. 3. *Egernia multiscutata* 11 km N.W. of Chinaman Flat.

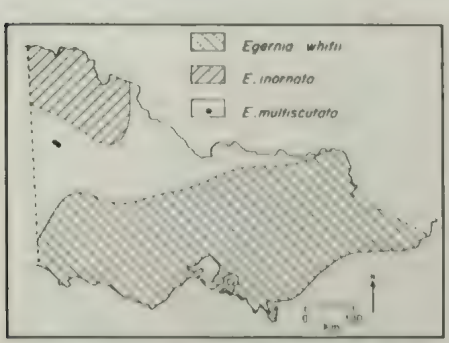

Fig. 4 Map showing Victorian distribution of the *Egernia whitii* group of skinks.

Distribution:

Cogger (1979) shows the distribution of *E. multiscutata* as "Kangaroo Island and Eyre and Yorke Peninsulas of South Australia to the coastal regions of southern Western Australia, including many offshore islands." Storr (1968) listed the distribution, under *E. multiscutata bos*, as "subhumid semiarid sandplains and coastal dunes of south-western and southern Australia . . . South Australia: west coast of Eyre Peninsula, St. Francis Island, Thistle Island, Yorke Peninsula and Kangaroo Island".

During field research being conducted in north western Victoria in March 1980, the first Victorian specimens of *E. multiscutata* were collected by the authors from two large sand dunes in the Big Desert. These dunes were approximately 11 km. N.W. of Chinaman Well, 35° 51' S:141° 33' E. (N.M.V. Nos. D54086, D54107). In April 1980, a further specimen was collected 3 km. E. of Moonlight Tank in the Big Desert, 35° 46' S:141° 25' E. (N.M.V. No. D54425). These sites represent a considerable eastern extension of the recorded range of this species. The Victorian distributions of the *E. whitii* group are essentially non-overlapping (Fig. 4)

Habitat:

(Fig. 5). In Victoria *E. multiscutata* occurs on large sand dunes in desert heathland, dominated by *Banksia ornata*, *Leptospermum myrsinoides* and *Callitris verrucosa*, with very little ground cover. This species appears to live in small discrete colonies on the largest dunes, where individuals excavate extensive burrow systems (warrens) on the northerly slopes close to the summits. It was first located in Victoria by the presence of these warrens, which appear similar to those of *E. inornata* observed further north in the Sunset Country. Each *E. multiscutata* warren may have several entrances, cover an

Fig. 5 Habitat of *Egernia multiscutata* 11 km N.W. of Chinaman Flat.

area of two square metres, and be up to 60 centimetres deep. The lizards are communal, several often sharing a warren, with each animal possibly utilizing more than one warren.

The size of the colonies, as estimated by the number of warrens, appeared to vary. The first two, situated only a few hundred metres apart, were well established, with numerous warrens, while very few were located at the third colony. Although a number of similar dunes in the area between Chinaman Flat and Moonlight Tank were examined, no further evidence of this species was found. However, aerial photographs show that there are numerous large dunes with similar vegetation throughout the Big Desert. Some of these may support colonies of *E. multiscutata*.

The three known colonies are within a large area of "uncommitted land" available, among other things, for "extensive military training purposes" (L.C.C. 1977). The use of large tracked vehicles could place these populations at risk. To the east of this area is Wyperfield National Park, and to the west a large wilderness area (L.C.C. 1977). Beauglehole (1979) states that a corridor for movement between these two reserves should be considered when further reserves are planned within the uncommitted land. He also states that "the Chinaman Flat area provides a combination of ecosystems worthy of preservation". We concur, and suggest that any future reserves planned for the Big Desert should include the Chinaman Flat-Moonlight Tank area, encompassing the known *E. multiscutata* colonies.

Acknowledgements:

Thanks are due to the following people who assisted us in various ways: J. M. Dixon; P. Lawson; A. A. Martin; P. Mather; K. C. Norris and P. A. Rawlinson.

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Wilsons Promontory: An Introduction To Its Geology

BY GARY L. WALLIS

Five years after the discovery and naming of Wilsons Promontory by George Bass, the French explorers Peron and Buadin, in 1803, described the Promontory thus:

> ". . . the coast is very high and is composed of two or three tiers of mountain ranges lying one behind the other. The aspect of the country is agreeable only at a distance. That which terminates at the borders of the sea is composed only of enormous masses of mud and sterile rocks, piled one upon the other."

No landing was made by the French explorers or they may have recognised the land as light coloured granite commonly covered with tall vegetation (much of which has since been destroyed by fires, as seen by the skeletal remnants along the mountain ranges.)

Wilsons Promontory, forming the southern-most part of the Australian mainland, is well known to naturalists for its diverse scenery and contrasting ecosystems. These contrasts are controlled by geological factors. Broadly, the Promontory consists of a central granite mountain chain which rises over 750 m above sea level and plunges into deep fern gullies whose shapes are largely determined by structures within the granites. The rugged coastline of the Promontory is broken by the development of broad sandy beaches which only occur where protective granite spurs protrude into the sea. Sand dunes behind the beaches have delayed stream entry to the sea and extensive river flats and swamps occur. Over a dozen granite islands occurring off-shore are the result of coastal submergence.

Geological investigations have been surprisingly rare considering the popularity of the area for scientific research in other disciplines. This may be partly due to the earlier belief that granite masses were largely homogeneous, rather than composite, and therefore of little interest. It was only recently that some of the intrusive features and two of the major granite types were recognised (Worboys, 1973). Only two major geological studies have been undertaken on this National Park, "The Geology of the Wilsons Promontory Batholith" (Wallis, 1980) and "The Coastal Geomorphology of Wilsons Promontory" (Tuddenham, 1970). The geology consists of early Devonian (dated on K/Ar at 392 million years) granitic bedrock (the Wilsons Promontory Batholith) with flanking of Quaternary sediments.

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Wilsons Promontory Batholith

The granites of Wilsons Promontory are the northern end of a granite belt which is almost 500 km long and about 50 km wide. The belt extends into north-eastern Tasmania as well as along its east coast.

North of Wilsons Promontory the main granite mass terminates against Ordovician sediments at Red Bluff, near Yanakie, however granite dykes which may be related intrude Ordovician sediments further north. Near the centre of the present township of Foster a thick north-south trending granite dyke was the site of a goldrush in 1870. Mining of quartz veins associated with this dyke yielded several thousand ounces of gold.

The granitic mass can be described generally as grey, coarse-grained, biotite granite. Within this mass over ten major varieties of granite, with distinctive textures and mineralogical differences, can be mapped on the Promontory and its surrounding islands. The different granites are sheet structures of 10 m to over 100 m thick. They commonly have shallow easterly dips and outcrop largely as parallel zones. Although varying in

relative amounts between these different granites, four essential minerals are always present.

1. *Biotite* or black mica occurs as thin flakes.
2. *Quartz* is often coarse (over 1 cm) and rounded in section. This unusual shape of quartz (bipyramidal B habit) is due to its high temperature crystallization in the cooling granite.

White feldspar is of two main types, ie:

3. *Plagioclase* (Andesine-Oligoclase) and
4. *Orthoclase* which often forms giant rectangular shaped crystals about 5 cm long. Important accessory minerals occurring in the granites are pink *Garnet*, blue-grey *Cordierite*, and black *Tourmaline*. The cordierite has often been altered to a green mica. Tourmaline is a mineral which occurs in a number of forms within the granites, particularly the light coloured granites.

All through the Promontory thin black tourmaline veins, usually with several sub-parallel to each other, can be seen cutting the granite (e.g. north end of Norman Beach). Tourmaline also occurs as nodules, as crystals in cavities, and as replacement of earlier feldspars in granites and aplites. In rare dykes of pegmatite it has been found as crystals up to half a metre in length. Associated with tourmaline in the north-eastern portion of Wilsons Promontory tin mineralization occurs in the form of cassiterite, an oxide of tin, which is its main ore.

Between 1920 and 1936 about 200 kg of cassiterite was mined from hillside gravels on the Mt. Hunter-Singapore saddle area. More recently, in 1967, extensions of these tin deposits were prospected for in Corner Inlet, where a drill hole near Bennison Island penetrated over 100 m of marine sands and clays without encountering the expected granite gravels. A different company applied for a drill licence to test for tin in the inlet early this year.

The minerals in the granite are the result of crystals growing in a liquid rock as it began to cool deep within the earth (several kilometres below the surface and at about 800° Celsius). As it slowly moved up towards the surface it cooled completely and became solid rock. Many clearly observable features at Wilsons Promontory show how later granites have forced their way through earlier rocks as a crystal mush, to form this huge granite complex. Such features are particularly well exposed at the southern end of Norman Beach and on Norman Pt., but are wide spread along the west coast.

Xenoliths or "foreign stones" are the common dark rounded patches within the grey granite. The xenoliths are an integral part of this batholith and highlight its flow, as do the large white orthoclase crystals. Recent research has shown that some of these xenoliths may originate with the granite liquid at a zone of melting deep within the earth's crust. The Wilsons Promontory granites result from the partial melting of sedimentary rocks. Locally, xenoliths have been concentrated into a rock looking somewhat like plum-pudding.

Within the coarse granites finer grained microgranites and aplites occur as gradational layers and thick dykes. These finer grained rocks are more common to the east. At South-East Pt., below the Lighthouse, is a flat-lying dyke of fine-grained grey granite from which the Lighthouse was built in 1859.

Fig. 1 Xenolith granite has intruded and surrounded a block of pale granite, thus proving the pale granite's earlier age (Oberon Bay).

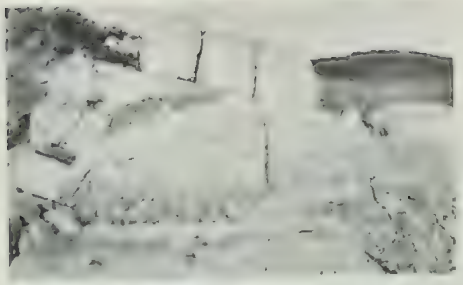


Fig. 2 "Plum pudding" rock A concentration of xenoliths near a contact with pale granite (Oberon Bay).

During, and subsequent to, their cooling the Wilsons Promontory granites were subjected to regional stress which resulted in fracturing and rock movement. Faults produced by these movements are mostly vertical. The present shape of the Promontory is a consequence of these lines of faulting as well as the smaller scale cooling joints in the granites. Erosion along fault lines controls many valleys such as Lilly Pilly Gully and the upper reaches of Tidal River. Norman Island is almost divided in two by erosion of a 200 m wide zone of east-west faulting.

The promontory granites have been exposed as a result of the removal of thousands of metres of overburden. Today the eroded granite is often seen as large rounded boulders called tors. Their origin is due to the regular joint pattern. The joints tend to be at right angles to each other producing large approximately square blocks of granite. Water seeping along these joints decomposes the granite to clays and gravel. Tors are the rounded core stones left after weathering of these joint blocks. Tors dot the hillsides, particularly along the Boulder Range and many majestic examples can be seen near the saddle on the Waterloo Bay track. Wind erosion has further sculptured the tors.

Marine erosion has carved sea caves into the jointed granite. Such caves occur on both the east and west sides of the Promontory and its offshore islands. On Great Glennie Island a 25 m deep cave occurs even behind the beach in the sheltered cove. On the same island, a large gully on the north-eastern side results from collapse of the weathered roof of a sea cave. Cleft Island ("Skull Rock") has a spectacular example of cave development. The top cave is over 20 m above sea level with a 60 m high roof. Its origin most likely relates to higher sea levels of the past.

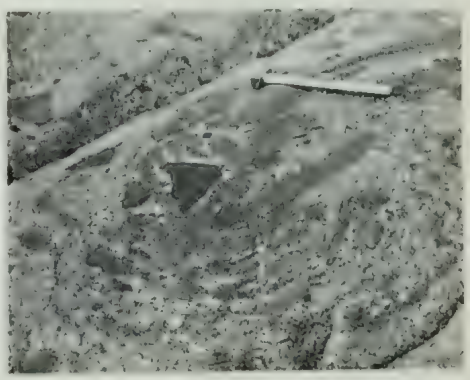


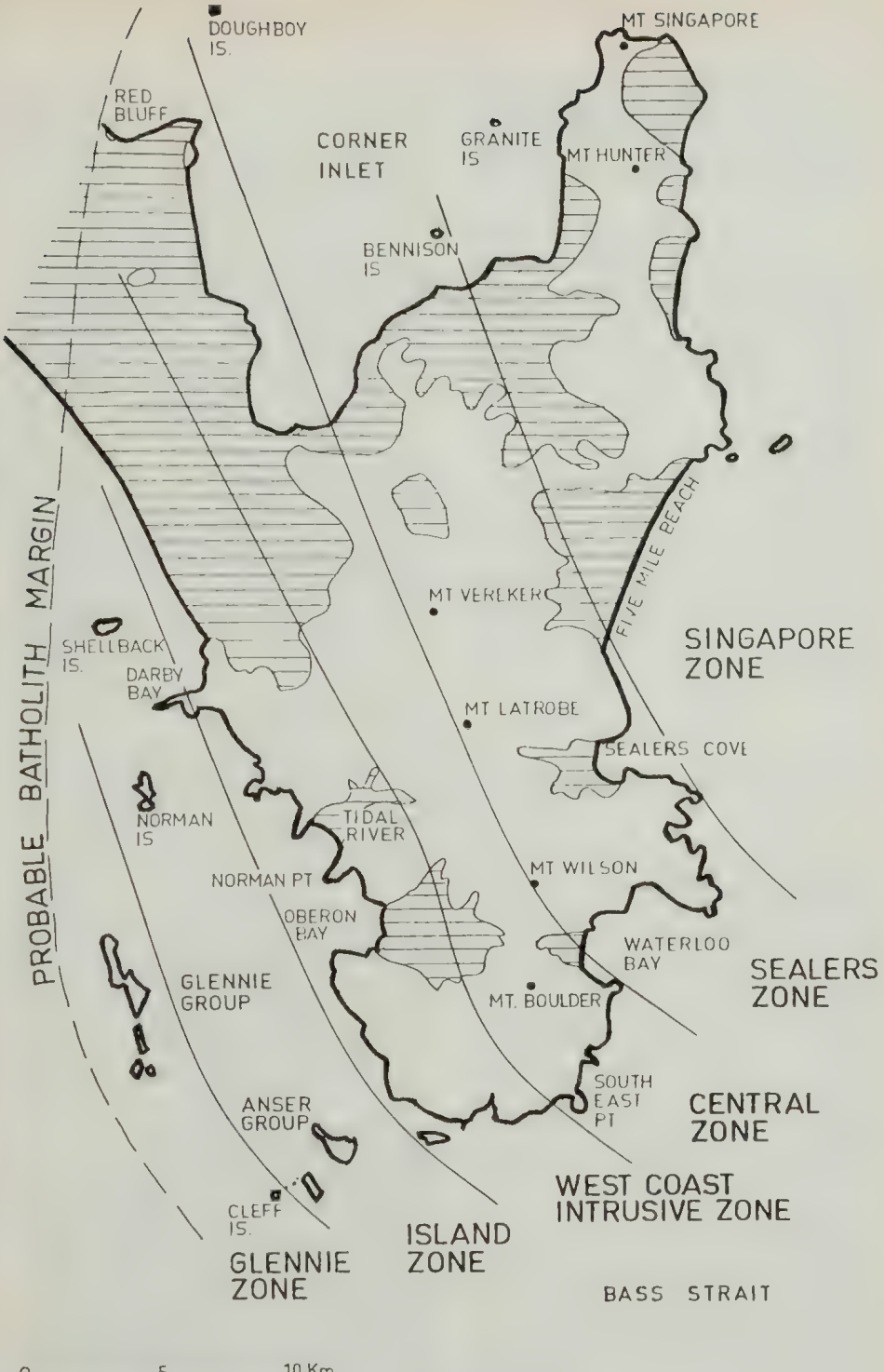
Fig. 3 A whorl of xenoliths, garnet and feldspars formed by flow in the intruding granite magma.

Fig. 4 Weathered granite wall of a collapsed sea cave (Great Glennie Island)

Quaternary Sediments

Overlying the granites are four main phases of sand dune formation, peat deposits, and recent beach sands. All have been controlled by major sea level changes during the Pleistocene Ice Age.

Wilsons Promontory forms an important dividing line between two main sand types in southern Australia. The west-east contrast is between yellow



WILSONS PROMONTORY BATHOLITH

lime-rich (over 30% carbonate) sands to the west and white silica-rich (less than 5% carbonate) sands to the east as illustrated by the beaches of Oberon and Waterloo Bays.

Studies have shown that during an earlier interglacial (100,000 years ago) when Wilsons Promontory was an island, the white silica sands drifted across what is now Corner Inlet and the Yanakie Isthmus and down the west coast. These sands are usually inland of the present yellow beach and dune sands, such as occur at Norman Bay. Squeaky Beach is a notable exception as here the foredune backing the beach is white silica sand of well-rounded and even sized grains. The beach originates from erosion of the dune, but at the water's edge an inter-fingering of recent yellow sands coming from offshore can be seen. If the dry silica sands are walked on, they will "squeak", as the grains rub together.

Calcarenites, wind blown dune sands that are cemented by lime dissolved from shell fragments, form vertical cliffs at Darby Bay. Remains of wood taken from a fossil soil horizon in the calcarenites have been dated at greater than 40,000 years. Off-shore at Darby Bay these rocks extend to Shellback Island, and down to depths of at least 20 m below sea level, where a submerged cliffline records a marine stillstand. This evidence of lower sea levels coincides with data elsewhere in the Bass Strait region which suggests sea levels dropped between 85 m and 100 m during the last glacial maximum. At that time Wilsons Promontory was a part of the landbridge with Tasmania. The earlier silica sand movement from the east was halted against the east side of the promontory and lime-rich sand began accumulating against the west side. Prevailing westerly winds moved the lime-rich sand inland and formed a number of parabolic dunes, some of which reached thicknesses of 100 m. Calcarenite remnants of these dunes occur elsewhere along the west coast and on the Glennie and Anser Island Groups. The calcarenites are presently quarried in the National Park for local use as fertiliser lime.

In the Darby River area peats have accumulated in fresh water swamps between calcarenite dunes. Some peat layers are up to 1 m thick. A radiocarbon date of 5,880 years was obtained for the bottom of one layer.

Recent sand deposition has built the present beaches and coastal dunes since sea levels rose to about their present height 7000 years ago. Buried shell beds and Aboriginal midden deposits are common in sand dunes all around the Promontory. The oldest of these are dated at 6,550 years and can be seen along the west coast between Yanakie and Darby River.

Alluvial and swamp deposits consisting mainly of detritus derived from the weathering of the granite extends to the coast from the foot of the granite mountains and hills. Large low-lying areas of poorly drained country occur, for example, to the north of the Vereker Range where the land drains to Corner Inlet. Coastal dunes bank-up swamp deposits behind most beaches and cause rivers to flow parallel to the coast for some distance before entering the sea. The swamp and river behind Sealer's Cove is a fine example of this. An extensive swamp has formed behind the Five Mile Beach. Similar features occur at Three Mile Beach, Darby

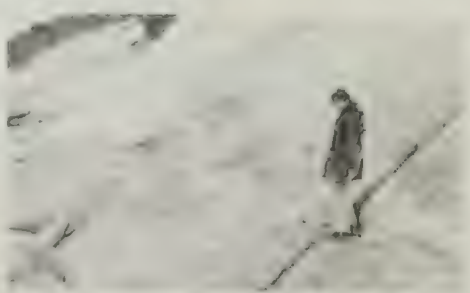


Fig. 5 Gradational contact between coarse and fine grained granites (Sealers Cove)

Beach, Norman Bay, Oberon Bay and Waterloo Bay.

Bass Strait was created in its present form when the land link with Tasmania was severed as a result of sea level rises due to the decline of the last worldwide glaciation. The coastline of Wilsons Promontory shows the results of coastal submergence with many off-shore islands, active erosion of granite and calcarenite cliffs, and sand accumulation in the more sheltered bays.

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Australian Natural History Medallionist for 1980: Michael J. Tyler

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Geographic Variation in the Common Wombat, *Vombatus ursinus* (Shaw, 1800)

G.E. Young

Introduction

The common or forest wombat, *Vombatus ursinus* (Shaw, 1800), is a large fossorial marsupial found in the south-east of mainland Australia, on Flinders Island in Bass Strait and in Tasmania (McIlroy, 1973). Some of the smaller islands in Bass Strait were previously inhabited by wombats, but European settlement in the late 18th and early 19th centuries may have contributed to their extinction. Many naturalists have in the past classified the Bass Strait and Tasmanian forms of wombat as separate species (Spencer and Kershaw, 1910; Troughton, 1967). However, recent examination of some morphological characteristics indicates that there is a simple gradation of structural differences between the mainland and insular forms of wombats. These morphological characteristics can be correlated with the log of the areas of the mainland and islands inhabited by wombats.

Materials and Methods

Only adult wombat data have been used during this study, and because I found no significant difference between male and female body lengths or body weights I have combined the data. McIlroy (pers. comm.) and Crowcroft (1967), similarly, reported no sexual dimorphism in either the common wombat or the hairy-nosed wombat, *Lasiorhinus latifrons* (Owen, 1845).

Body measurements

Weights and lengths of mainland (N.S.W.) wombats were obtained from live specimens trapped at Bondo, near Tumut, N.S.W. Tasmanian data were obtained from the South Australian Museum, S.A. and the Australian National Wildlife Collection held at the Division of Wildlife Research, CSIRO in Canberra, A.C.T. Flinders Island wombat body lengths were obtained from the National Museum of Victoria, Victoria.

Body weights were measured to the nearest gram. Body lengths were measured to the nearest millimeter with a flexible steel tape measure. Lengths were measured from the tip of the rhinarium along the curvature of the dorsal surface to the base of the tail.

Skull measurements

Cranial measurements of mainland (N.S.W.) wombats are from skulls found near Canberra. Tasmanian wombat skull data were obtained from Spencer and Kershaw (1910) and from the Australian National Wildlife Collection held at the Division of Wildlife Research, CSIRO. Flinders Island skull data were obtained from the National Museum of Victoria. Deal Island and King Island skull data were from Spencer and Kershaw (1910) and the National Museum of Victoria.

The maximum skull lengths were measured to the nearest millimeter from the basioccipital to the palate, posterior to the incisors, using a vernier caliper. Maximum widths were measured to the nearest millimeter with a vernier caliper across the widest section of the zygomatic arches.

Results

Body measurements of wombats from different geographic locations are summarised in Table 1. I could find no data for body weights of the Flinders Island form or any body measurements for the now extinct wombats from Deal Island and King Island.

The mean body lengths of mainland (N.S.W.), Tasmania and Flinders Island

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Table 1. Body measurements *(Vombatus ursinus)* from different geographic locations.

Location	n	Body weight (mean ± S.E.) (kg)	Body length (mean ± S.E.) (c.m.)
Mainland (N.S.W.)	20	26.22 ± 0.45	98.5 ± 0.84
Tasmania	11	20.60 ± 0.76	84.78 ± 1.34
Flinders Island	7	—	69.54 ± 4.32

forms show a significant correlation ($4 = 0.89$; $P < 0.01$) with the log of the area of the island on which they inhabit (Fig.1).

Mean skull measurements of *Vombatus ursinus* from four geographic locations are presented in Table 2. The mean skull length and mean skull width are significantly correlated with the log of island area (length, $r = 0.97$; $P < 0.05$; width, $r = 0.97$; $P < 0.05$) (Fig. 2).

There is also a significant linear relationship between skull lengths and skull widths of wombats from each locality ($r = 0.95$; $P < 0.001$) (Fig.3).

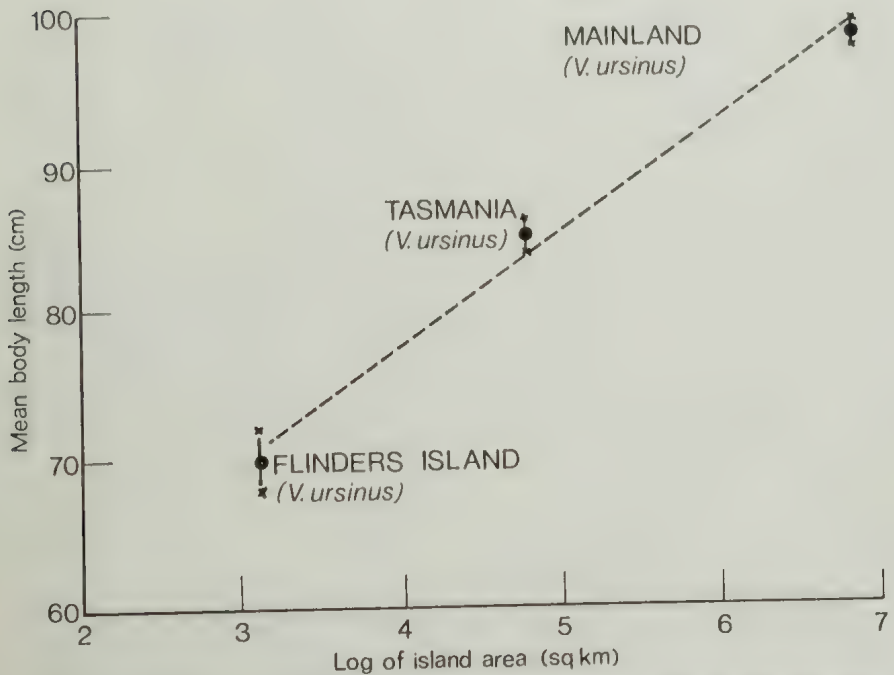

Fig. 1. Relationship between mean body length (± S.E.) and log of the mainland and island areas.

Table 2. Skull measurements *(Vombatus ursinus)* from different geographic locations.

Location	n	Maximum length (Mean ± S.E.) (c.m.)	Maximum width (Mean ± S.E.) (c.m.)	Ratio (w/l)
Mainland (N.S.W.)	10	15.54 ± 0.31	13.41 ± 0.27	0.86
Tasmania	15	14.55 ± 0.18	12.25 ± 0.17	0.84
Flinders Island	29	13.07 ± 0.08	11.17 ± 0.09	0.85
Deal & King Islands	4	12.46 ± 0.41	10.44 ± 0.15	0.84

Discussion

The islands of Bass Strait have been separated from the mainland for about 10,000 years (Jennings, 1971). However, during this relatively short geological period the common wombats which were isolated on some of these islands have developed marked differences in morphology.

The gradation of differences in size (Fig. 3) between the populations of mainland and insular wombats suggest

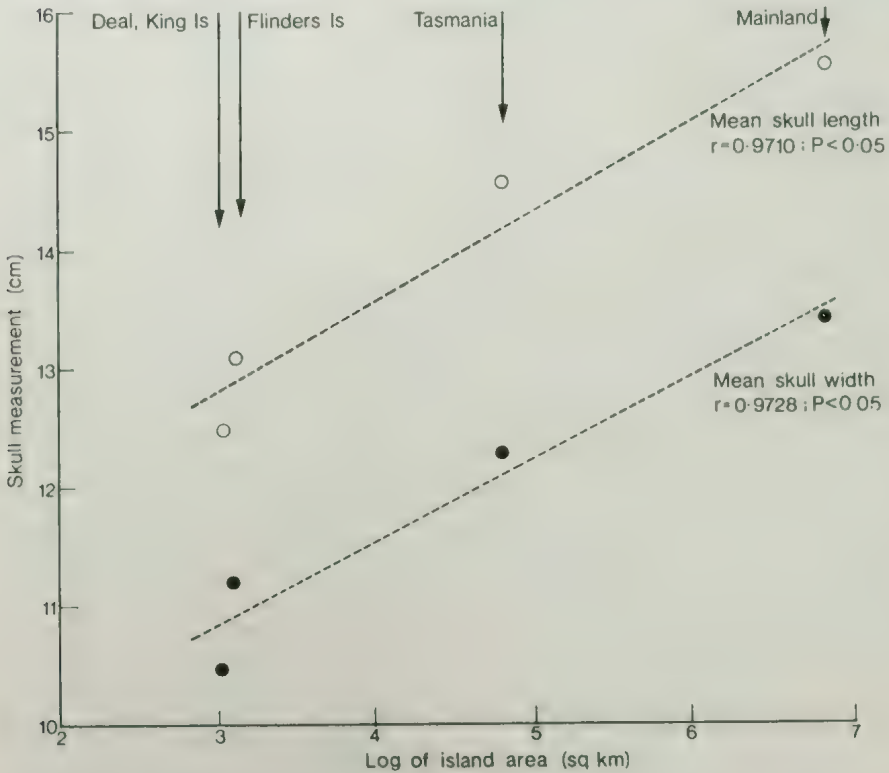

Fig. 2. Relationship between mean skull measurements and log of the mainland and island areas.

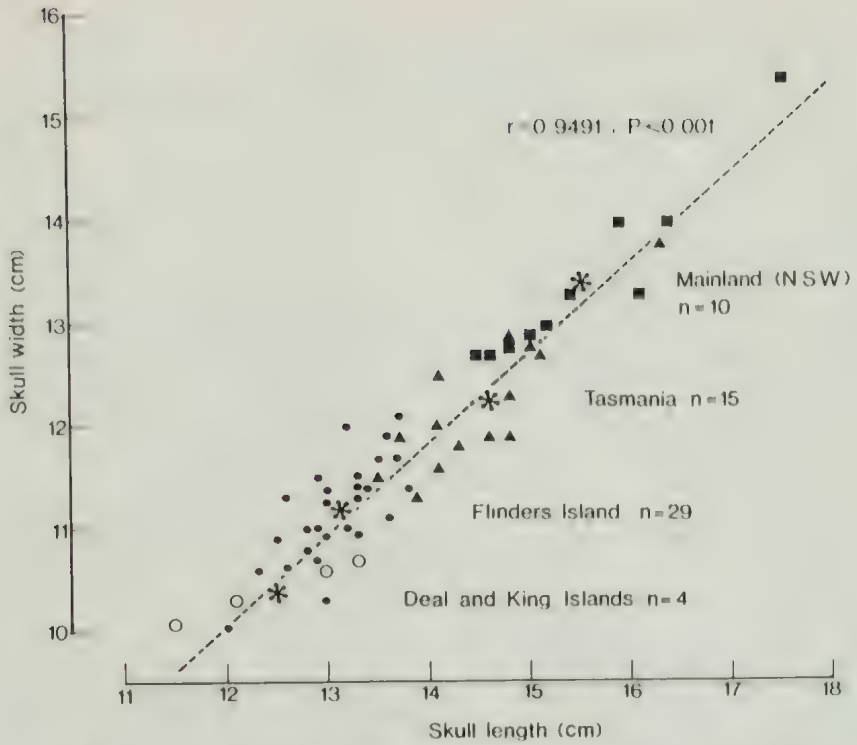

Fig. 3. Relationship between skull widths and skull lengths of *Vombatus ursinus* from different geographic locations. ■ Mainland (N.S.W.), ▲ Tasmania, ● Flinders Island, O Deal and King Islands, * mean.

that they are simply subspecies of *Vombatus ursinus* (Shaw, 1800).

It is well documented that mammalian species of large body size evolve toward a smaller body size when isolated on small islands (Foster, 1964). Heaney (1978) gives a brief review of the casual factors affecting variation in mammalian species isolated on islands. He has presented four factors which may cause these variations: food limitation, predation, interspecific competition, and selection for physiological efficiency. These factors are thought to be related to island area and to be of varying importance on different sized islands (Fig. 4).

Food limitation is probably the casual factor which has affected the body size of the insular wombat forms. Foster (1964, p. 235) has reported that in mammalian species the result of a limited food supply would cause malnutrition and stunting of the young animals. He continues by stating ". . . the initial rapid genotypic decrease in size would be followed by a more gradual selection and adaptation of the phenotype to the optimal and smaller size".

Interspecific competition may also be a contributing factor, however, it is not known if the small macropods inhabiting the smaller islands feed on the grass (*Poa* spp.) which constitute a major part of the wombat's diet (McIlroy, pers. comm.).

Predation on the smaller islands would be limited to the time of European settlement as there are no natural predators of the common wombat on these islands. In Tasmania there has been only limited natural predation on wombats in the past by the now probably extinct thylacine, *Thylacinus*

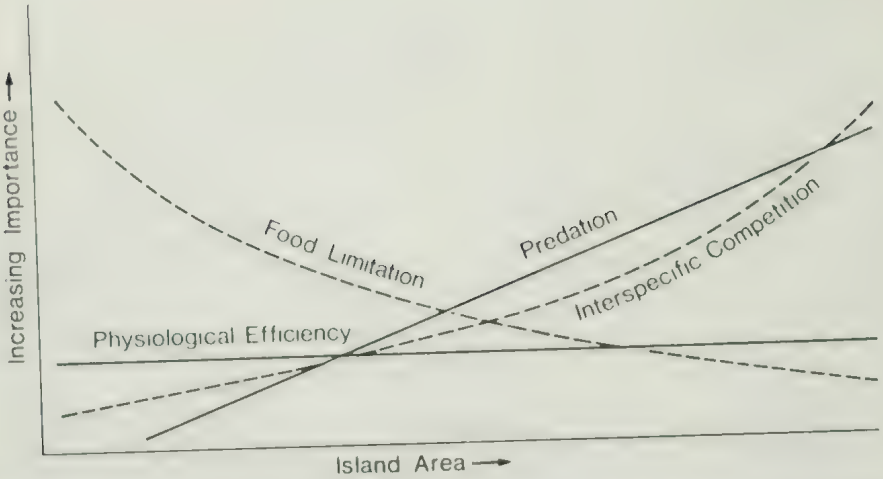

Fig. 4. Trends in importance of major factors thought to affect body size of mammals on islands. (From: Heaney, 1978).

cynocephalus. However, on the mainland the dingo, *Canis familiaris*, is reported to be a predator of the wombat (Catling, pers. comm.).

Adaptation for physiological efficiency in wombats is probably less important than the preceding factors and is unlikely to be influenced by island size.

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AUSTRALIAN NATURAL HISTORY MEDALLION FUND

Amount on hand invested May 1980		$1463.50
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A technique for live trapping the Yellow-bellied Glider *Petaurus australis;* with notes on the biology of the species

By S.A. Craig*, and C. A. Belcher*

Introduction

The Yellow-bellied glider *Petaurus australis* (Shaw) (Fig.1) has aroused much interest over the years because of its characteristic vocalizations and feeding habits, but studies of its life history have been few, probably because the technique used to capture specimens (Fleay 1933) has been unsuitable for such studies. We have now developed a trapping technique which allows *P. australis* to be captured and released unharmed and with minimum stress. Our method may be further refined, but appears suitable for a detailed study of this particular glider.

In this paper we describe our trapping technique, the results of our trapping program, and our observations on the feeding habits and habitat preferences of the species. The pouch morphology of the females captured is also briefly described.

Methods

Four types of traps (Fig. 2) were tested:

(A) A trap designed by the Wildlife Research Section of the Fisheries and Wildlife Division. The trap is made of self supporting wire mesh and measures 550 mm x 260 mm x 260 mm. This trap was originally designed to be placed in a horizontal position and has a drop bar which falls down as the door closes and prevents the escape of the trapped animal.

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To capture *P. australis* with this trap we removed the drop bar fitted a spring to the door and a wire catch to the base of the door frame. This catch was over-ridden as the spring-tensioned door closed but prevented the door from opening against the spring once the trap had been set off. With these modifications the trap can be set in a vertical position with the door facing up or down.

(B) A trap constructed from 2 small-mammal wire cage traps 725 mm x 205 mm x 165 mm. The rear panels were removed before joining the traps back to back. The door at each end is spring loaded and both doors close together when the trap is set off.

(C) A trap constructed from 2 large Elliot type B traps 900 mm x 150 mm x 115 mm. The rear panels were removed before joining the traps back to back. The standard spring loaded door remains at each end.

(D) A trap constructed from 2 wire hoops, 510 mm in diameter and fitted with 12 mm nylon mesh netting. Both hoops are fixed to a base board: one is static the other is an extension of the spring section of a rat trap. The trigger mechanism of the rat trap releases the free hoop which closes over the animal.

Traps were set on feed trees, recognised by characteristic V-shaped channels cut into the bark. Wakefield (1970) suggested that *P. australis* cut these channels in order to collect sap. Such feed trees provide evidence of the local occurrence of *P. australis*. Experimental trapping was carried out at Wingan In-

Fig. 1 The yellow-bellied glider *Petaurus australis* (Shaw)

let, 149°31'E 37°44'S; Cambarville, 145°56'E 37°31'S; and Murrindindi, 145°34'E 37°23'S. Trap sites were chosen because of the abundance of gliders as judged by the frequency of their calls and feed trees. At Wingan Inlet, where all types of trap were tested, the traps were either nailed in position or secured by rubber straps to feed trees *(E. gummifera)* at varying heights (5-10 m) above ground. The traps were baited with candied honey wrapped in gauze cloth, and parts of the tree leading to the trap were smeared with honey.

At Cambarville and Murrindindi, Type A was the only trap used. Traps were nailed to feed trees *(E. obliqua, E. cypellocarpa, E. viminalis)* and on adjacent unused trees 5 m above ground (Fig. 3). Candied honey and a mixture of peanut butter, rolled oats and honey were used as bait.

Animals captured were weighed and sexed. Females were examined for breeding condition and presence of pouch young.

Information used to construct the distribution map (Fig. 4) was gathered

from records held in the files of the Fisheries and Wildlife Division, Victoria (FWD); the National Museum of Victoria; the Mammal Survey Group of Victoria and a review of the literature (see Deerson D. *et al.* 1975, Emison *et al.* 1975, Nicol, S.L. 1978, Norris *et al.* 1979).

Fig. 2. Four types of traps tested. Left to Right = Type A, B, C, D.

Results

P. australis was trapped in trap types A, B and D. Type A was the easiest to set and remove, had fewest design problems and caused less stress to captured animals.

Type B was difficult to set and allowed the only animal caught to escape because the trap was set with insufficient tension on the spring. Type D was awkward to handle and caused excessive stress in the animal which made it difficult to remove and handle.

Discussion

The results indicate that the technique described can be successfully employed for the live trapping of *P. australis*. Although we trapped at Cambarville for only a 3 month period the declining success rate (Table 1) suggests a seasonal variation in the allure of the bait or an increase in trap shyness. The trapping results correlate with our observations that animals were active on feed trees during the four months August — November 1979, but not during December 1979 and January 1980 although they were active in the surrounding forest.

Harrison (1961) found that honey placed regularly on trees attracted *P. breviceps* more effectively during the 5 months May-September, when few eucalypts were in flower and insects were less readily available. FWD observations indicate that *P. australis* uses feed trees most often during winter months.

The dietary importance of exudates from cuts in feed trees is not known, but Wakefield (1970) suggested that the exudates were less important than nectar and insects. Wakefield (1970) recorded *P. australis* utilizing the following Victorian eucalypt species as feed trees: *Eucalpytus viminalis, E. bridgesiana, E. globulus, = bicostata (Wakefield 1970), E. rubida =* dalrymplena (Wakefield 1970), *E. gummifera, E. cypellocarpa, E. obliqua* and *E. nitens, P. australis* feeds on the sap and probably the nectar of all these and also *E. fastigata, E. globoidea, E. muellerana, E. regnans, E. sieberi, E. elata, E. delegatensis, E. baxteri, E. ovata* and *E. aromapholoia.*

Gould (1863) described *P. australis* as feeding on nectar and insects whereas Fleay (1933) and Brazenor (1934) recorded the species feeding on the blossoms of *E. viminalis* and the gum exudates of eucalypts in the Mt Wills area of Victoria. In 1977 MacFarlane (Forests Commission, Victoria *pers. comm.)* recorded *P. australis* sheltering in *E. cypellocarpa* tall open-forest in gullies of the Boola Boola State Forest and moving to the drier ridges to feed in flowering *E. sideroxylon.* In August 1979 K. Norris and L. Ahern (FWD *pers. comm.)* observed *P. australis* feeding in flowering *E. sideroxylon* along Hospital Creek, east Gippsland.

Fig. 3. Trap type A nailed to a *Eucalyptus cypellocarpa* feed tree near Cambarville.

Distribution

Gould (1863) gave the distribution of the species as between Port Phillip Bay, Victoria, and Moreton Bay, Queensland; Troughton (1941) extended the recorded distribution to Gin Gin near Bundaberg, Queensland; Wakefield (1970) gave the range as from Bundaberg to the forests north-west of Portland, Victoria; and in 1979 Winter (National Parks and Wildlife Service, Queensland, *pers. comm.)* recorded the species at Mt. Spurgeon in the Herberton Range, Queensland.

The present distribution therefore extends from Nelson, Victoria, through southern and eastern Victoria and eastern New South Wales to Mt. Spurgeon, Queensland.

Habitat

In Victoria *P. australis* inhabits many structural types of eucalypt forests from 1200 m to sea level; for example, subalpine woodland (Mt Tingaringy, Wulgulmerang plateau, Nunniong plateau), tall open-forest (Errinundra plateau, water catchments N.E. of Melbourne, Otway Ranges), foothills open-forest (Colquhoun State Forest, between Bruthen and Buchan, Cobbo-boonee Forest, between Heywood and Nelson) to coastal open-forest (Lake Tyers, Wingan Inlet, Mallacoota Inlet).

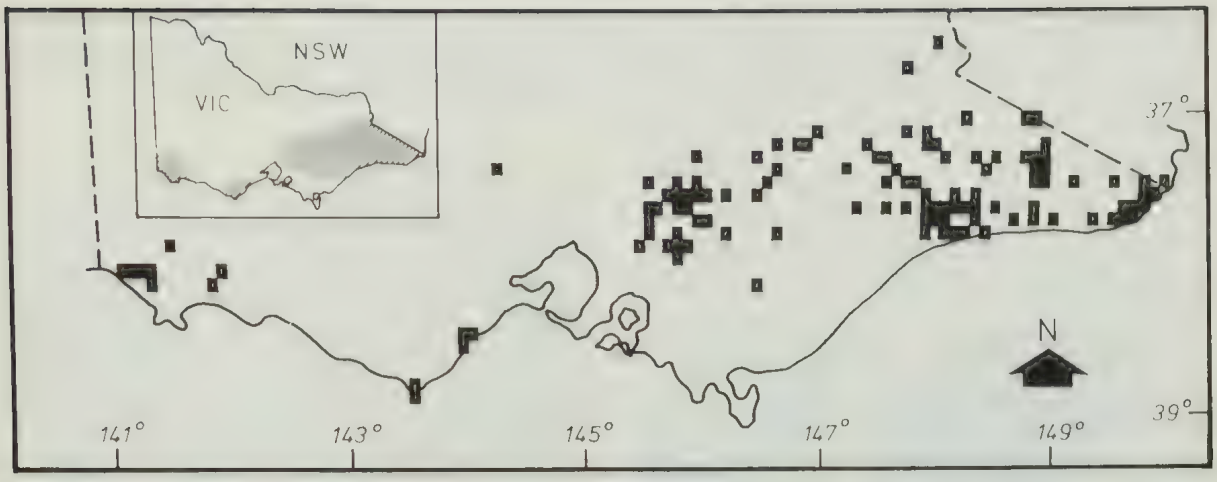

Fig. 4. Distribution of *Petaurus australis* in Victoria 1970-1980.

Within these diverse forest types the presence of the animals is closely correlated with the presence of mature trees presumably because they provide nesting hollows.

Pouch morphology

The pouch morphology of *P. australis* is similar to that of *P. breviceps*, which Jones (1924) describes as follows:

"The nipples are four in number. The pouch is distinctly bilocular when containing the young, and consists of two lateral pouches extending far on to the flanks of the animal; the opening is near to its anterior extremity in the undilated condition."

One of the two females caught at Cambarville and the female caught at Murrindindi each had a single pouch young. The pouch young were not removed from pouches but it is assumed that they were attached to a nipple. No other nipples could be found in the pouches.

Table 1 Results from trapping program for *P. australis*

Site and trapping period (1979)	No. of trap nights	No. of *P. australis* caught	Trap rate (%)	Weight (g) and Sex of P. australis caught	Non-target species caught
Wigan Inlet 4 Aug.	4	3	75	600(F) 652(M) *	*T. vulpecula* *P. breviceps*
Cambarville 16-24 Oct.	21	4	19	640(M) 533(M) 600(M) 550(F)	*T. caninus*
12-22 Nov.	55	1	2	520(F)	*T. caninus*
11-13 Dec.	33	0	0		
Murindindi 25 Nov.	2	1	50	510(F#)	
Total	115	9	8		

* Glider caught in trap, but escaped before trap could be reached.
Unfurred pouch young present.

The pouch morphology of all three was similar in that each had a pouch consisting of two compartments separated internally by a well-developed furred septum. The compartments and the septum were not visible until the lateral lips of the median pouch opening were stretched apart (Fig. 5).

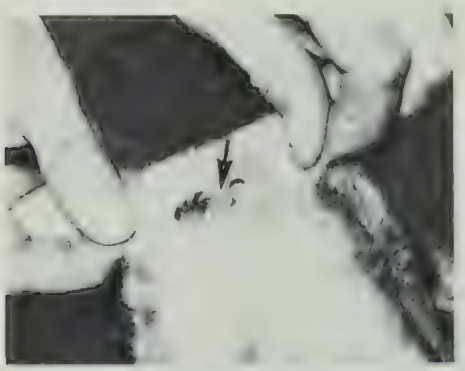

Fig. 5. The pouch of *Petaurus australis*. The compartments and the septum are not visible until the lateral lips of the median pouch opening are stretched apart. Arrow indicates septum.

The female without pouch young, caught at Cambarville, had two nipples, located on and each side of the furred septum, not on the dorsal surface of the pouch as expected. The female caught at Wingan Inlet had no pouch young and her pouch morphology was different to that of the other three females. Two separate external openings were found lateral to the mid-line when the belly fur was parted. This female was highly stressed and examination was difficult as the muscular lips of the openings were tightly constricted. Consequently, we were unable to determine whether each opening led to a common pouch or to two entirely separate compartments. However, we think that each opening probably led to a separate compartment and the furred septum separating these compartments was visible as belly fur. We suspect that as the young develops and the pouch expands, the septum is drawn down to become an internal part of the pouch, leaving a single external opening controlled by muscular lateral lips. The Wingan Inlet female may have been nulliparous.

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We would also like to thank staff of the National Parks of Victoria who made the initial trapping at Wingan Inlet National Park possible.

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The Swamp Antechinus (*Antechinus minimus maritimus*) — Notes on a Captive Specimen

The Swamp Antechinus *(Antechinus minimus)* is a small, insectivorous, dasyurid marsupial which, on the Australian mainland, is considered rare and restricted in distribution to SE South Australia, SW and coastal Victoria with an eastern limit at Wilsons Promontory (Wainer and Gibson, 1976). The Tasmanian subspecies, *A. m. minimus* is common on the Bass Strait Islands and Tasmania (Green, 1972).

In August, 1978, a female *A. m. maritimus* was trapped in coastal tussock grass and sedge habitat at the mouth of the Powlett River. The animal carried six pouch young each about 5 mm long which would probably have been born during the previous week. The mother and young were subsequently kept indoors in a large (1.5 x 0.5 x 0.3 m) aquarium containing sawdust, grass and nesting material. A varied diet was provided, including fresh meat, mice, skinks, grasshoppers, mealworms, bread and a regular mixture of Harper's Puppy Chow mixed with raw egg, milk and Pentavite drops. This paper reports on observations made during the development of the young as well as thermophysiological data recorded from experiments on the mother.

Behaviour and development

Many species of *Antechinus* are monoestrous and show a post-mating mortality among males (Lee, Bradley and Braithwaite, 1977). The antechinus in this study was trapped on 15/viii/78 and the young (crown-rump length 5 mm) were estimated to have been less than one week old. Such an estimate is based on crown-rump measurements of 4.9 and 4.5 mm reported for new-born *A. stuartii* (Marlow, 1961) and *A. swainsonii* (Williams and Williams, 1980) respectively. Given a gestation period of about 30 days as in most other *Antechinus* species (Woolley, 1966) mating would have occurred in early July. Wainer (1976) found *A. m maritimus* on Greater Glennie Is. mated in late May, June and early July; *A. m. minimus* in Tasmania, however, mates in September (Green, 1972).

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In *A. swainsonii* mating also occurs later in the Tasmanian subspecies than in the mainland form; in the monoestrous species of *Antechinus* both latitude and altitude of habitat appear to be important determinants of timing of mating.

The female had eight nipples but only carried six young. Eight is the characteristic nipple number in *A. m. maritimus* but the Tasmanian subspecies has only six (Wakefield and Warneke, 1963). A similar situation exists in the mainland and Tasmanian subspecies of *A. swainsonii* (Wakefield and Warneke, 1963).

The young grew rapidly during their period of nipple attachment and when four weeks old body lengths were about 35 mm. They were dropped in the nest four and a half weeks after capture (18/ix/78) by which time they were lightly furred. For the next few weeks the mother preferred to take food into the nest and eat it there — whether the young ate any of it could not be determined. The young first vocalised on 20/ix/78 uttering high-pitched squeaks. The mother's response to this sound generally was to return to the nest. The only vocalisation of the mother was a rare, low hissing sound produced when she appeared agitated.

When six weeks old the young made excursions from the nest, either independently or on the mother's back. Although the adult's greatest periods of activity were early evening and three hours around dawn, the young were active at random times over the 24 hours. The mother made new nests in early and mid-October — apparently in response to increased size of young. The nests were commenced with a hollow and the surrounds "added on", they had a single opening and were kept very clean.

The young were first observed feeding off solid food at 8 weeks although they suckled for another month. When 10 weeks old the young were given a dead mouse. They were unable to tear the fur from the carcass and had to rely on the parent to do so. (Generally the parent ate sometime after the young had started feeding). Instead, the young antechinus tended to eat the head, tail and limbs, with the two largest excluding the

others until they had apparently had sufficient.

On 31/x/78 one of the larger pouch young died and by a further 17 days all young had died. Cause of death remains unknown, but prior to death the eyes closed up and motor locomotory activities were uncoordinated. Two of the bodies were eaten by the surviving animals.

The development of young *A. minimus* shows similarities to that in *A. swainsonii:* they are probably born about the same size, fur is developed in both species after four weeks and age of weaning is the same (14 weeks). However, the age when young are dropped in the nest is earlier in *A. minimus* (42 d. versus 56 d.), as is the time when solids are taken (63 d. versus 84 d.) (Williams and Williams, 1980).

Measurements taken of the adult are within the range for female *A. m. minimus* (Green, 1972), with the exception of the mainland specimen having larger body length and skull dimensions than those recorded in Green's study.

Thermophysiology

Some time after the death of the young, oxygen consumption rate (OCR) of the adult was measured at several ambient temperatures (Ta's). The methods are similar to those reported in Wallis (1976) except gases were analysed with a Beckman E2 oxygen analyser. The resting OCR (1.13 cm^3 O_2/g hr) in the thermal neutral zone is slightly greater than that predicted for a 43 g marsupial (0.92 cm^3 O_2/g hr.; Dawson and Hulbert, 1970), but truly basal levels were probably not achieved in the limited experiments with *A. minimus*.

At lower Ta's, endotherms increase heat production to maintain homeothermy. The slope of the OCR v Ta curve is a measure of the animal's thermal conductance; for the *A. minimus* the value of 0.20 cm^3 O_2/g hr. °C is in accord with that predicted (0.23) for a similar sized marsupial by Kinnear and Shield (1975). The animal used in these experiments was able to remain normothermic (body temp. 35.4 °C) to Ta's as low as 3 °C presumably by dint of a good insulation, high activity and shivering. It is also possible that small marsupials can increase heat production in the cold by non-shivering thermogenesis (Wallis, 1979). No low OCR in response to cold was observed. This does not discount the occurrence of torpor in this species — in *A. stuartii*, torpor as an adaptation to cold is observed only during winter in response to starvation (Wallis, 1976).

Torpor has not, however, been observed in the larger *A. swainsonii* (Ingham, 1977), although both *A. swainsonii* and *A. stuartii* show a lability in body temperatures (as low as 31 °C) all year round which doubtless confers some energy saving.

Although it is dangerous to generalise from the results for one animal, the limited data presented here indicate the similarities in thermophysiology between the three southern Victorian species of *Antechinus*, particularly in terms of body temperatures, metabolic rates and ability to tolerate cold.

Acknowledgements

Thanks are due to Grant Singleton for his expertise in trapping. The work was carried out under permit from the Fisheries and Wildlife Division.

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Erroneous or Doubtful Victorian Vascular Plant Grid Records

BY A. C. BEAUGLEHOLE †

Introduction

Since the publication of 'A Handbook to Plants in Victoria' by J. H. Willis (1970 & 1972) and 'The Distribution of Victorian Plants' by Churchill & de Corona (1972), the present author, with the help of others, has been compiling a list of species with Major Grid records which are considered to be erroneous or very doubtful. These records were brought about in a number of ways e.g. misidentification, confusion with other species and earlier unspecific records assigned to two grids, such as BC (Big (Desert), DJ (Grampians), DE (Lower Glenelg), KP (Otways) etc.

The Land Conservation Council of Victoria (1970) conveniently divided Victoria into 13 Study Areas and has already published Reports, Proposed and Final Recommendations with a wealth of valuable botanical information in several of these for the general public. However the L.C.C. readily recognized that not all botanical data could be presented and agreed with the present author that he write up and publish his own account. For this, we must be very grateful to the Ministry for Conservation and the L.C.C.

Thanks to substantial financial support from the Utah Foundation, financial assistance and encouragement from the Western Victorian Field Naturalists Clubs Association and kindred organizations, assistance from the Ministry for Conservation and La Trobe University Botany Department — in particular Dr. R. F. Parsons, two Study Area Reports have been published (Mallee 1979 & Corangamite 1980).

In the Mallee Report the author dealt with over 80 Major Grid records which had been previously published but were now regarded in the Report as erroneous or doubtful records and for Corangamite Report about 30 Major Grids were also considered as such. Because Grids ABF were completely and G was mostly within the Mallee Study Area and Grid K was completely within the Corangamite Study Area, it was rather simple to isolate such erroneous or doubtful records. However, as the majority of remaining Study Areas contain certain Grids which fall into more than one Study Area, the task will be much greater.

In an endeavour to obtain clarification of all possible erroneous or doubtful records, it is extremely important that the present author receives the fullest co-operation of all concerned. To minimize inconvenience, the author has specially designed Recording Sheets to ensure uniformity amongst the many helpers.

Details of records, especially if substantiated by herbarium specimens, should follow thus: Name of species; Collection number (collector's initials before such); Study Area (abbreviated to two letters e.g. MA — Mallee, CO-Corangamite); Sector (if known; see Mallee & Corangamite Reports); Major & Minor Grids; Sub-Block (if known); Land Status (see abbreviations in Mallee-1979 and Corangamite-1980

Study Area Reports); Location (important to give direction and distance km from prominent town or landmark); Collector; Date of collection; Person responsible for determination; If checked by an authority please include name; Herbaria where collections are housed. Recording Sheets must be filled in adequately and clearly otherwise record may be rejected.

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Acknowledgement

I wish to thank all those persons who have helped with up-dating of our Victorian flora (persons too numerous to mention individually).

Erroneous or doubtful Victorian vascular plant grid records

The following list is based on the alphabetical arrangement of Churchill & de Corona (1972).

NOTE: Erroneous records already listed by Beauglehole (1978, 1979 & 1980) are repeated to form a single comprehensive list. In all, 311 individual grid records are affected.

The author would welcome additional information.

* Species introduced into Victoria

Acacia farinosa B
A. hakeoides D
A. lanigera D
A. suaveolens E
Acaena anserinifolia A
A. ovina E
Acrotriche depressa J
A. serrulata B
**Aira caryophyllea* AB
Alisma plantagoaquatica E
Alyxia buxifolia B
Amphibolis antarctica WXZ
Amyema quandang D
Angianthus strictus E
Apium prostratum C
Arthrocnemum arbuscula BC
Asterolasia asteriscophora D
Astrotricha ledifolia CDJM
Avicennia marina D
Azolla pinnata C
Banksia spinulosa E
Blechnum cartilagineum K
Boronia anemonifolia D
B. filifolia B
Borya nitida C
Brachychiton populneum A
Brachycome angustifolia EJN
B.cardiocarpa B
B. multifida E
B. radicans D
B. scapigera D
B. trachycarpa E
Caesia vittata A
Caladenia tessellata B
Callitris rhomboidea B
Calocephalus brownii B
Calystegia marginata D
Carex pumila AB
Cassinia arcuata D
Caustis flexuosa EK
Centrolepis aristata B
C. cephaloformis J
C. glabra B
Ceratophyllum demersum Z
Cheiranthera cyanea K
Chenopodium carinatum DHJN
C. pseudomicrophyllum E
Choretrum spicatum D
Chorizandra enodis B
**Cirsium arvense* BCG
Comesperma ericinum CD
Corybas diemenicus V
Cratystylis conocephala B
Cressa cretica E
Cryptandra amara ABCD
Cyathodes juniperina N
Cyperus gunnii A
Dampiera rosmarinifolia D
**Datura innoxia* R
Daviesia genistifolia B
Deyeuxia brachyathera D
Dichelachne micrantha AB
Dillwynia glaberrima BM
Dodonaea angustissima E
D. bursariifolia D
Drosera auriculata BF
Epacris microphylla K
Epilobium gunnianum C
Eriostemon difformis ACDHJ
Eucalyptus albens T
E. botryoides T
E. calycogona S
E. consideniana E
E. dives KX
E. glaucescens VZ

E. goniocalyx EK
E. macrorhyncha EP
E. maculata Z
E. mannifera D
E. melliodora E
E. obliqua F
E. polyanthemos D
E. sideroxylon K
E. viminalis F
Galium propinquum DE
Gentianella diemensis EK
Gompholobium ecostatum B
Goodenia lanata CH
Grevillea dimorpha S
G. rosmarinifolia E
Gypsophila australis K
Hakea lissosperma Z
H. microcarpa E
H. muellerana E
H. rugosa E
H. sericea E
Helichrysum adenophorum B
H. bracteatum E
H. obcordatum K
Helipterum australe K
H. demissum K
Heterozostera tasmanica EWXZ
Hibbertia aspera E
H. calycina CD
H. procumbens D
Hydrocotyle hirta F
H. medicaginoides D
H. tripartita EJ
Hypolepis australis K
Hypoxis glabella AB
Ixodia achilleoides B
Juncus australis CEHKLMQUX
J. filicaulis ADE
J. pallidus AFG
J. pauciflorus HM
J. vaginatus M
Laxmannia gracilis DJXZ
Lepidosperma elatius DEJK
Lepilaena preissii C
Leptocarpus brownii B
Leptomeria aphylla AB
Leptorhynchos waitzia K
Leptospermum juniperinum F
Leucopogon australis E
Lobelia rhombifolia K
Maireana excavata A
Melaleuca gibbosa K
Mentha satureioides DEK
Mitrasacme paradoxa B
Monotoca elliptica E
Muehlenbeckia cunninghamii K
Myosotis suaveolens DK
Myosurus minimus K
Najas tenuifolia C
Nicotiana suaveolens D
Notelaea venosa K
Nymphoides crenata EKNW
N. geminata S
Olearia axillaris B
O. picridifolia B
Opercularia varia A
Oplismenus aemulus W
Phebalium squameum E
P. stenophyllum B
Plagiobothys elachanthus E
Plantago muelleri S
Platylobium obusangulum A
Poa poiformis D
Polygonum subsessile E
Pomaderris prunifolia D
Prasophyllum brevilabre D
P. hartii K
P. rogersii E
Prostanthera decussata N
P. melissifolia Z
P. walteri R
**Psilurus incurvus* D
Psoralea parva D
Pterostylis cycnocephala A
P. decurva E
P. furcata K
P. obtusa D
P. robusta B
Ptilotus obovatus D
Pultenaea acerosa DJ
P. cunninghamii E
P. daltonii K
P. foliolosa S
P. hibbertioides DJ
P. juniperina R
P. largiflorens D
P. pedunculata B
P. platyphylla DJ
P. prolifera H
P. prostrata EN
P. retusa DJMPV
P. stricta HRWZ
P. subumbellata R
P. tenuifolia JN
Ranunculus papulentus E
R. plebeius D
R. robertsonii B
Rhagodia hastata BCK
Rorippa laciniata A
**Rubus cissburiensis* WZ
**R. ulmifolius* E
**R. vestitus* T

Schoenus carsei T
S. subaphyllus D
Scirpus congruus DJ
S. inundatus A
S. stellatus B
Scleranthus diander A
**Senecio vulgaris* A
Solanum americanum K
**S. nitidibaccatum* J
S. pungetium U
S. simile WZ
**Soliva pterosperma* B
Sparganium antipodum R
S. erectum J
Spyridium spathulatum B
Stackhousia viminea BE
Stylidium calcaratum BE
Stypandra glauca E
Styphelia adscendens E
Tasmannia lanceolata D
Tetragonia tetragonioides K
Tetrarrhena juncea E
Tetratheca bauerifolia EMT
Teucrium corymbosum B
Theleophyton billardieri K
Thismia rodwayi Z
Thysanotus juncifolius C
T. tuberosus AB
Triglochin striata UV
Trithuria submersa BK
Uncinia riparia Z
Xanthorrhoea australis B
Zygophyllum billardieri A

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Flanged Button Australites and Lenses Found Recently

In the January-February 1978 issue of the *Victorian Naturalist* I reported finding a flanged dumb-bell australite at Simpson in August 1978. Searching the same general area of a disused sandpit adjacent to the junction of Boulevard Road with the Simpson-Princetown Road on Tuesday, 20 November, and Friday, 23 November 1979, I found two perfectly preserved flanged button australites.

One of the australites is of comparatively large dimensions and weighs 8.83 grams and measures 2.5cm in diameter. The smaller australite which is also almost perfectly preserved, weighs 2.66 grams and has a diameter of 1.8cm.

The larger australite, when found, was partly buried in hard grey sand but shows virtually no sign of wear from wind or other eroding elements at all. The larger australite has distinctive flow lines, and although almost perfect, has a hairline fracture through its centre, clearly the result of its impact with the earth.

The smaller australite was lying in some eroded clay and sand, and probably had been washed out during the preceding night by heavy rain.

The larger of the two australites has a heavy flange and there is an indication that the flange was being melted over prior to its arrival on Earth. In addition to the two well preserved australites, the author also found a further shiny, but broken button australite in the same vicinity.

Amongst a variety of other australite fragments, buttons, cores and other shapes found during the recent Christmas vacation, I found two australite lenses of rather larger than the usual size. Both were located in eroded gravelly ground in the general area of Loch Ard Gorge on the same day. One is perfectly preserved lens, the other slightly broken but otherwise intact. The former weighs 0.54 grams and is 1.5cms in diameter and is almost perfectly round, whilst the broken lens weighs 0.42 grams, has a diameter of 1.3cms, but is inclined to be oval in shape.

H. V. Feehan
Doncaster, Vic.

Bush-peas of Victoria — Genus Pultenaea — 14

BY M. G. CORRICK*

***Pultenaea weindorferi* F. M. Reader in *Vict. Nat.* 22:51 (1905)**

Pultenaea weindorferi is endemic in Victoria and, although restricted to a few scattered localities in the central and southern parts of the State, it may be locally plentiful, and in one or two places it is the dominant under-storey shrub. It is usually found in poorly drained areas, often along low-lying roadsides or the margins of swamps.

P. weindorferi is a slender, erect, usually glabrous shrub about 1.5-2 m high. The alternate leaves are 8-12 mm long and 1 mm wide and may be either linear with incurved margins or terete and grooved on the upper surface. The leaf tip is obtuse and slightly recurved.

The dark brown, papery stipules have a prominent mid-rib and are united to about half their length. The tips are recurved, but on older growth they may be torn or broken.

The axillary flowers are bright yellow and clustered in apparent heads at the tips of the branches. The standard is 8 - 9 mm high and 6 - 7 mm wide with a few dark purple lines in the throat. The wings and keel are yellow.

The calyx is 5-6 mm long with a pedicel 2 - 4 mm long. The lobes are acuminate, longer than the tube and are edged with short, fine cilia and have a few, scattered, fine hairs on the inner surface. There is also a ring of short hairs at the base of the pedicel.

The slender, lanceolate or linear bracteoles have incurved margins and are attached to the base of the calyx tube. They are about 4-5 mm long and reach almost to the tips of the lobes.

The floral leaves with enlarged stipules show a gradation to a floral bract with only a small vestigial leaf under the youngest, or innermost flowers of the inflorescence.

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The ovary is glabrous with a long, slender style. The pod is also glabrous, plump and exserted from the calyx. The style is not retained on the pod for long.

Flowering time is from early October in the Dandenongs to early November in Wombat Forest.

A distinctive form of *P. weindorferi* with soft, long hairs on calyx and leaves occurs in the Kinglake National Park.

SPECIMENS EXAMINED included: Wandin, *M. G. Corrick 6487*, 20.i.1980 (MEL 1517728); Wombat Forest, *Barry Kemp* 4, xi. 1976 (MEL 558275); Upper reaches of Bunyip R., *T. B. Muir 1285*, 2.x.1960 (MEL 558277); Kinglake National Park, *P. S. O'Connor*, 18.x.1975 (MEL 558272); Swamp at Wandin, *G. Weindorfer*, ix.1903 (MEL 35428) Type.

***Pultenaea capitellata* Sieber ex DC. in *Prodr.* 2:112 (1825).**

This is an uncommon species in Victoria, having been recorded only on the Bogong High Plains and in a small area of East Gippsland round Bidwell and Bendoc. It also occurs in the Central and Southern Tablelands of New South Wales and in the Australian Capital Territory, but it is apparently not plentiful anywhere. It inhabits wet areas on the margins of swamps or near streams.

P. capitellata is a low, slender shrub, usually less than 50 cm high, of straggling habit and tending to be hidden in taller, denser undergrowth. The stems are pubescent and the alternate, obovate leaves are 3-12 mm long and 2-5 mm wide with slightly recurved margins. The upper leaf surface is glabrous, with prominent veining; the under surface is covered with closely appressed, pale hairs. The obtuse leaf tip has a slender, fragile mucro which may not be retained on older leaves. The dark, inconspicuous stipules are about 1 mm long.

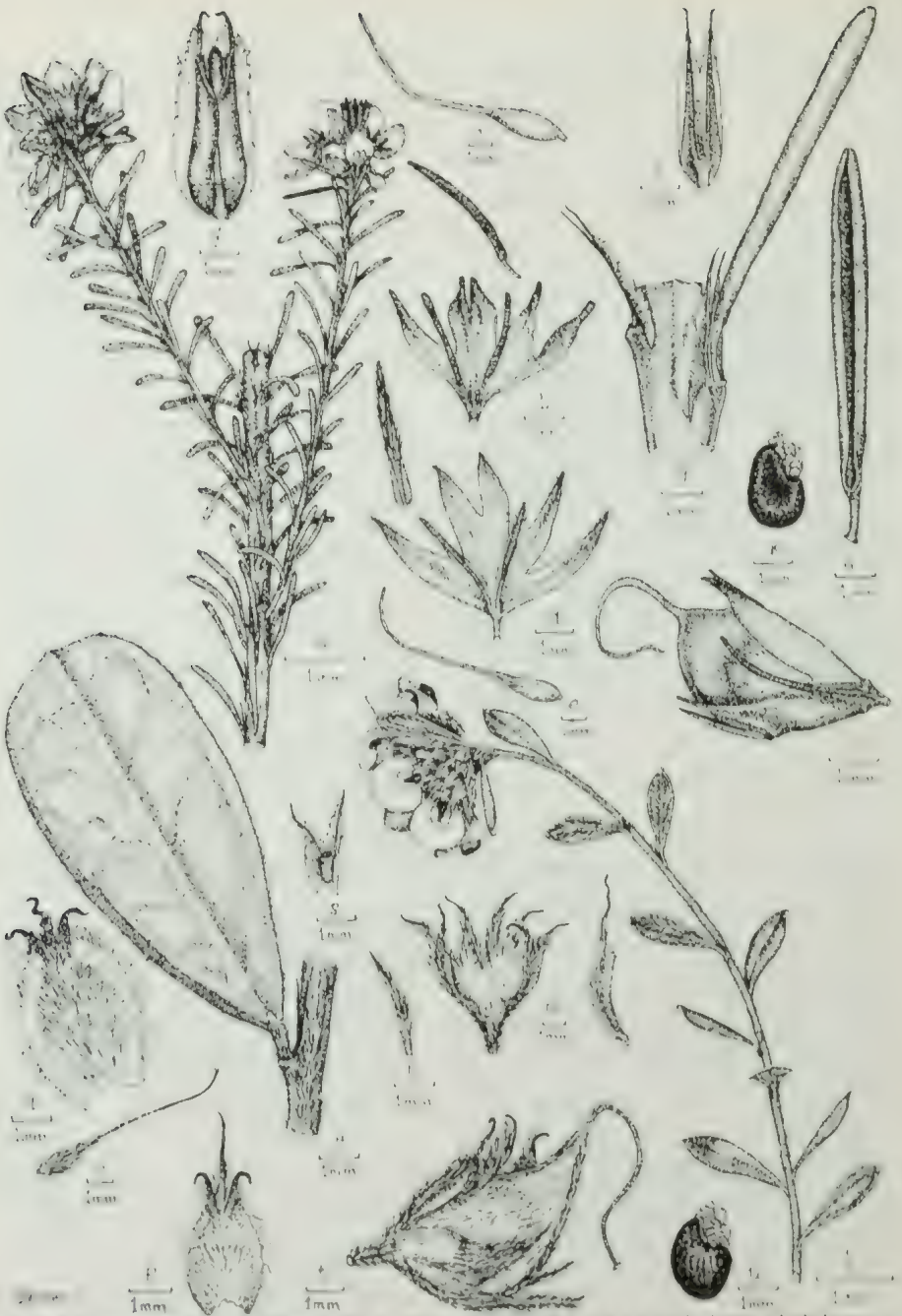

Fig. 18. a-k, *Pultenaea weindorferi*: a, habit; b, calyx and bracteoles, one bracteole drawn a little larger; c, style and ovary, all from MEL 558271; d, calyx and bracteoles, one bracteole drawn a little larger; e, style and ovary, both from hairy form from Kinglake National Park, MEL 558272; f, floral bract, g, leaf and stipules; h, upper side of leaf; i, stipule, all from MEL 558271; j, pod, k, seed, from MEL 1517728. l-u, *Pultenaea capitellata*: l, habit; m, calyx and bracteoles, one bracteole drawn a little larger, from MEL 534233; n, bracteole from MEL 561420 to show variation; o, style and ovary; p-q, floral bracts showing the variation of the central lobe; r, leaf and stipule; s, stipule, all from MEL 534233; t, pod, from MEL 524234; u, seed, from MEL 561420.

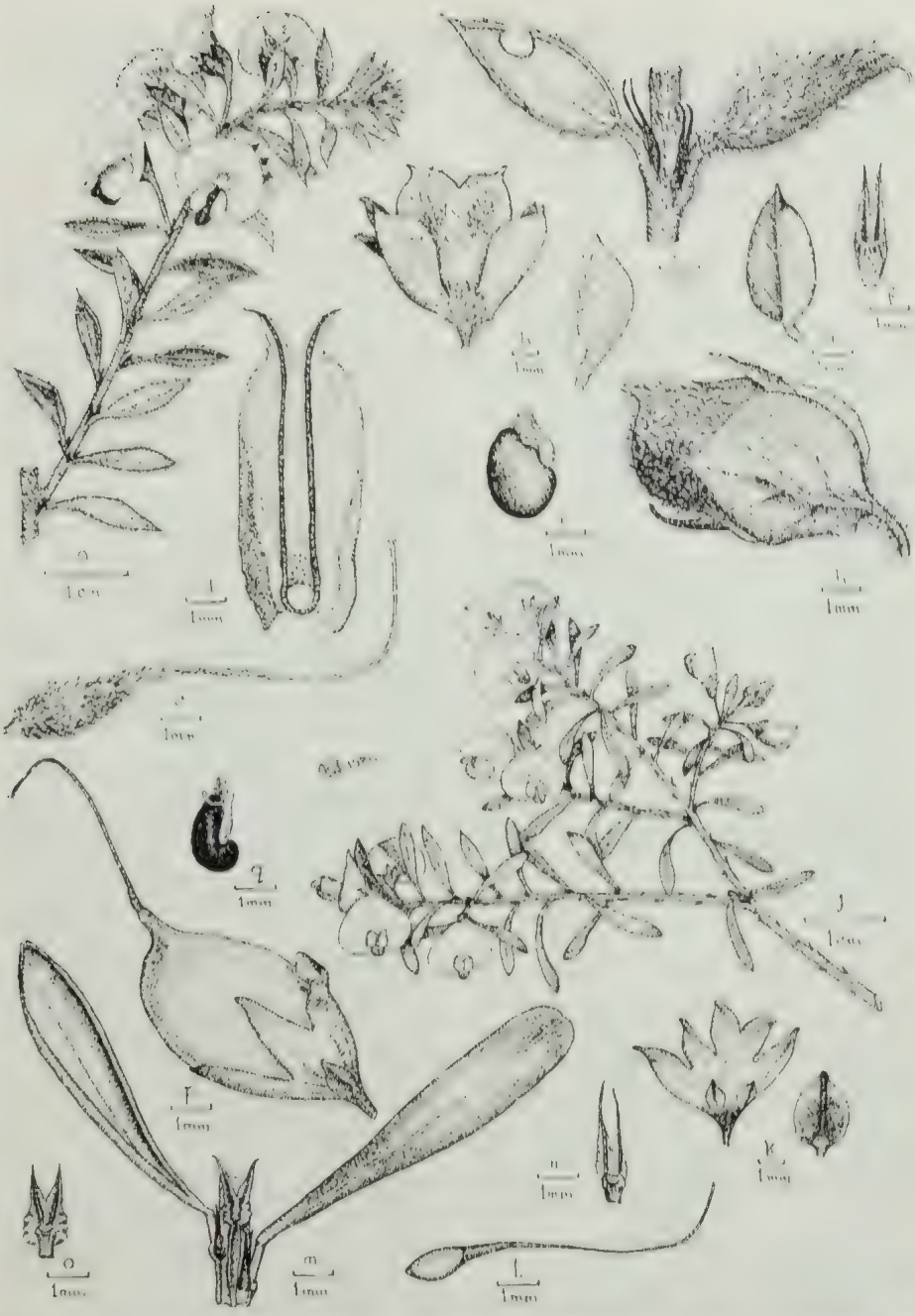

Fig. 19, a-i, *Pultenaea vrolandii:* a, habit; b, calyx and bracteoles, one bracteole drawn a little larger; c, style and ovary; d, floral bract; e, leaves and stipules (large leafed form from Pine Mtn); f, stipule, all from MEL 526368; g, typical leaf from the Strathbogie Ranges (MEL 35419); h, pod; i, seed from MEL 1518781. j-q, *Pultenaea altissima:* j, habit; k, calyx and bracteoles, one bracteole drawn a little larger; l, style and ovary; m, leaves and stipules; n, stipule; o, reduced stipule from within the inflorescence, all from MEL 563188; p, pod; q, seed, from MEL 563189.

The flowers are orange and dark purple, each about 10-12 mm long and clustered in heads at the tips of the branches. The standard is about 11 mm high and 8 mm wide, with fine, dark lines radiating from the throat almost to the edge; there are dark lines also on the wings and the keel is dark purple.

The calyx is hirsute, 8-9 mm long, with lobes tapering into long, slender points. The hairs are longer and denser towards the tips of the lobes and at the base of the tube. The slender, brown bracteoles have incurved, ciliate margins and scattered pale hairs down the centre. They are attached about half-way up the calyx tube and reach almost to the top of the lobes.

The flower heads are surrounded by numerous, brown, closely imbricate bracts with ciliate margins and a patch of pale hairs in the centre. The tips of the bracts split into three distinctively shaped lobes.

The ovary is densely covered with long white hairs which extend about one third of the way along the very slender style.

The pod is flat and covered with pale hairs; the style is fragile and not retained on the pod for long.

Flowering time varies according to altitude from late November to late January.

SPECIMENS EXAMINED included: Gunmark Range Rd., *A. C. Beauglehole 34630,* 19.xi.1970 (MEL 534232); near Bendoc, *A. C. Beauglehole 34768,* 22.xi.1970 (MEL 534233); near Bendoc, *Charles French,* i.1889 (MEL 534234); New Holland, *Sieber 413* (MEL 534040) Syntype; Bogong High Plains, *J. H. Willis,* 19.i.1947 (MEL 535053).

***Pultenaea vrolandii* Maiden in *Vict. Nat. 22*:98 (1905).**

Pultenaea vrolandii is another species of restricted distribution, being confined to the granite hills of the north-east of the State, with an isolated occurrence near Braidwood in New South Wales.

P. vrolandii is a hairy, usually spreading shrub 0.5-2 m high. The stems are terete and covered with a woolly vestiture of mixed short and long hairs.

The alternate ovate or elliptic leaves vary in size from 3-14 mm long and 1-3 mm wide, tapering into an acute, pungent tip. The upper surface is glabrous and the lower surface is villous with pale hairs which are thicker and longer at the edges of the leaf. The leaf margins are incurved and in narrow leaved specimens the upper surface is almost concealed.

The slender, dark, resinous stipules are about 2 mm long with a distinct midrib; they are joined for about half their length.

The richly coloured orange and dark purple axillary flowers are pedicellate and clustered towards the tips of the branches. The standard is 11-12 mm high and 11-12 mm broad.

The calyx is 5-6 mm long with a pedicel of 5-6 mm. The upper calyx lobes are broad and obtuse and the three lower lobes are acuminate. The base of the calyx tube and the lobes are covered with rather loose, soft hairs.

The large, distinctive bracteoles are 4-5 mm long and 4-5 mm broad, resinous, distinctively veined, boat shaped and almost enveloping the calyx. There are no bracts but the stipules at the base of the pedicel are somewhat enlarged.

The ovary is densely covered with white, woolly hairs which extend more than half-way up the long slender style.

The pod is plump and hairy and more than half concealed by the calyx. Flowering time is late October to mid-November.

There is considerable variation in habit and leaf size between the main populations of this species. The typical form from the Strathbogie Ranges has small leaves and appears to be the least common form. On Pine Mountain and neighbouring hills the leaves are very large, but the plant is often low and spreading. Around Beechworth occurs a very robust form about 2 m high with

large leaves and graceful drooping branches.

SPECIMENS EXAMINED included: Pine Mtn., 30.x.1977, *M. G. Corrick 5991* (MEL 526368); Near Mt. Pilot, 24.x.1979, *May Galbraith* (MEL 1517492); Strathbogie Ranges, x.1902, *A. W. Vroland 175* (Herb. H. B. Williamson n. 974, MEL 1518775, Type.); Pine Mtn., 16.i.1964, *J. H. Willis* (MEL 1518781).

***Pultenaea altissima* F. Muell. ex Benth. in *Flor. Aust. 2*:123 (1864).**

This species is also rare in Victoria, being confined to a few localities round the upper reaches of the Genoa River. It has also been found in several localities on the Central and Southern Tablelands of New South Wales.

Pultenaea altissima is a tall, riparian, entirely glabrous shrub of about 2-3 m high. It is usually erect and may appear like a small tree; the stems are angled and the ultimate branches are somewhat drooping, particularly when heavy with flower.

The alternate obovate or oblanceolate leaves have obtuse tips and the upper leaf surface is usually paler, particularly when dry.

The dark brown stipules are 1.5-2 mm long with slender, acuminate tips.

The pale orange axillary flowers are pedicellate and are usually clustered at the extreme tips of the branches, often appearing almost umbellate. The standard is 8-9 mm high and 9-10 mm broad with slight brown markings in the throat.

The calyx is 4-5 mm long with a pedicel of 1-2 mm. The calyx lobes are broad, about the same length as the tube and are edged with fine cilia.

The bracteoles are broadly ovate, about 1 mm long and attached at the base of the calyx tube.

Most flowers in the inflorescence are subtended by a normal leaf with stipules which are somewhat reduced; occasionally only small, united stipules are present which are then regarded as forming a floral bract.

The ovary and the plump pod are both glabrous.

Flowering time is late September to mid-October.

SPECIMENS EXAMINED included: Upper Genoa River, 30.xi.1970, *A. C. Beauglehole and K. C. Rogers ACB 35084* (MEL 563189); Twofold Bay & Genoa R., *F. Mueller* (MEL 35079, Type.); Upper Genoa R., 17.x.1948, *J. H. Willis* (MEL 563188).

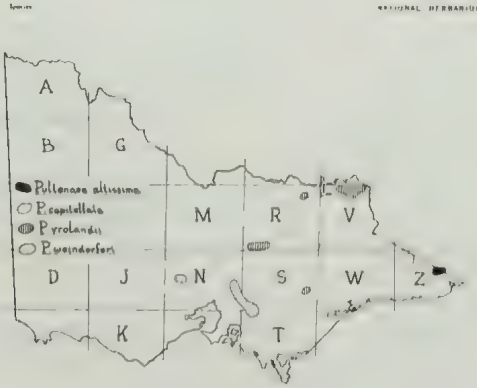

Fig. 18 a. Known distribution of *Pultenaea altissima*, *P. capitellata*, *P. vrolandii* and *P. weindorferi*.

Broken Hill: F.N.C.V. 25/8/79 to 6/9/79

A few impressions that will remain with us of Broken Hill are firstly the green vegetation and trees on approaching the city after the dry arid countryside during the drive from Wentworth, second the tin houses that are a reminder of the early days in Broken Hill, thirdly the well designed modern buildings with obvious thought to climatic conditions in their skilful construction, also historic buildings well cared for, and last but not least the helpful friendly people.

The Land Regeneration programme which accounted for the 'green feeling' on arrival was started way back in 1936-37 by the naturalist Albert Morris when he fenced off a few acres, where natural growth, (free from the destructive eating by rabbits, goats, and sheep) could recuperate. Within the fence the tussocky grass, saltbush, bluebush and native shrubs grew thick and high. Later the area was extended and protected with a rabbit-proof fence. Hardy trees were planted to hold the sand, and today a strip of land half a mile wide extends three-quarters of the way around Broken Hill, protecting it from drifting sand. The area is completely irrigated from the runoff of the sewerage works treatment plant. The supply of water was always a problem until the early 1950's when the 24 inch pipeline from Menindee to Stephens Creek reservoir was constructed. From here water is piped to Broken Hill through pumping stations, and even with this supply the water dwindles in the summer, to the houses on the outskirts of the city.

The Menindee lakes area is a significant sample of one of the major landscapes categories of the arid and semi-arid regions of New South Wales and is dominated by the Darling River, the complex system of overflow lakes around Menindee are filled during high floods and until recently, drained back into the falling river. The water conservation scheme designed in 1949 to impound, 2,000,000 acre feet of water from the Darling was constructed by New South Wales Conservation and Irrigation Commission and completed in 1960. Here the excess water from floods is stored and then used to maintain the Darling and the Ana Branch of the Darling at a reasonable level. This area is ideal for feeding, nesting and the breeding habitats of the various water birds.

In conjunction with Menindee is the Kinchega National Park which has four main ecological environments, The Overflow Lakes, The River Environment, The Red Sandhills, Sandplains and The Lunette Landscape. Most of Kinchega is a red sand country, which supports a grassland type of vegetation, with predominately Bluebush, and a scattering of Prickly Wattle, Hopbush and Cassia (drought resisters). Wildflowers were to be seen here and there but good rains are needed to see them in profusion. Kangaroos and emus were not seen until movement was detected, they resembled grey lumps of rock when resting, whilst along the scenic river drive the River Gums (*E. camaldulensis*) and the Coolibahs (*E. microtheca*) provide a habitat for many species of birds, Parrots, Honeyeaters, Choughs and Grey Thrush, also the Brush Tailed Possum.

The road between Broken Hill and Mootwingee has a number of natural water holes, which the early pioneers utilized by digging wells and sinking small earth ground tanks using horses, bullocks and camels. These became stopping places on the way to the White Cliffs Opal Fields, and the remains of old buildings can still be seen, also part of the railway viaduct which was washed away in a flood. Mootwingee lies north east of Broken Hill and is a small example of semi-arid rangeland where within spectacular rocky outcrops are found steep-sided gorges containing rockholes filled with water. This area because of its reliability has been the source of water for man and wildlife for thousands of years. Here was the home of the Aboriginal people and their engravings and paintings can be seen in the caves and on the rocks. We were also aware of the abrupt contrast between rugged ranges, vegetated tracts and bare rocky outcrops, where plants and animals have learned to adapt to this harsh environment. Red River Gums follow the main drainage tracts, along with Cassias, Hopbushes, Acacias, Solanum and Wahlenbergia. On the steep sheltered hillsides grow Cypress Pine, Native Lime, *Eristemon* and *Prostanthera*. The rocky plateau and ridges are host to the hardy Acacia, Eremophila, Silver Cassia and Maireana, and the bare rock area which at first appears to have no growth has in fact a covering of lichen. The Snake Trail gave us all a fair example of this very beautiful rugged Park.

The three hour conducted surface mine tour of the North Mine was very comprehensive and instructive and covered the processes from the rock ore from the mine to the separated minerals such as silver, lead and zinc, which in powder form is sent to Port Pirie for smelting. The rock ore in its crystalline form is very beautiful especially when embedded with rhodonite.

The highlights were to see the numerous patches of Sturts Desert Pea and the White Necked Heron in its breeding plumage.

6 Latrobe Valley Field Naturalists.

Eric and June Lubcke, Iris Petersen, Pearl Reeves and Jim and Peg Wall.

Supplementary notes

Enroute to Broken Hill we were guests of Sunraysia Naturalist Club for an evening meeting in Mildura, and an excursion across the Murray River in a north-eastern area of bush on 26th August. Help in identification of plants came from our leaders, and a "New Checklist of the Plants of North-West Victoria and South-West New South Wales with Distribution and Identification Aids": compiled by T. S. Henshall. Approximately 70 species were identified, and listed below are some of the plants in flower.

Geijeva parviflora — Wilga Tree with weeping habit, and branches dense with panicles of small white flowers and some fruits. We were to find this plant further north, but here is its most southerly latitude.

Olearia rudis — Azure Daisy-bush, a handsome shrub like an Easter Daisy and with sticky leaves.

Eremophila glabra — Common Emu-bush with green, yellow to dull red flowers.

Eremophila oppositifolia — Twin-leaf Emu-bush, white flowers and each with an enlarged calyx. This conspicuous shrub was found between Wentworth and Broken Hill.

Eucalyptus socialis — Grey Mallee.

Minuria cunninghamii — White Daisy-bush.

Helipterum pygmaeum — a minute Sunray, scented, forming ground cover carpets of white inflorescences.

Podolepis capillaris — conspicuous with its small white inflorescences on wiry stems.

Cassia nemophila — two varieties.

Ptilotus exaltatus — Lamb-tails with grey-pink inflorescences.

Swainsonia microphylla — racemes of small purple pea flowers.

Templetonia egena — a leafless shrub with yellowish-brown pea flowers.

Westringia rigida — stiff Westringia, with white flowers.

Craspedia pleiocephala — Soft Billy-buttons.

Helichrysum apiculatum — Common Everlasting.

Helichrysum bracteatum — Golden Everlasting.

Along the Murray River banks and flood plain we noted:

Eucalyptus camaldulensis — River Redgum.

Eucalyptus largiflorens — Black Box.

Acacia salicina — Willow Acacia.

Acacia stenophylla — Eumong Acacia.

Acacia victoriae — Bramble Acacia.

Stopping places on the Silver Highway between Wentworth and Broken Hill had priority for the brilliant display of *clianthus speciosus* — Sturt Pea. Again this plant was seen at its best beside the road to Menindee. It was interesting to find a variant colour of the flower. Other plants observed were:

Marsdenia australia — Austral Doubah, a slender climber, flowering, and bearing conspicuous pear-shaped fruits.

Acacia ligulata — Small Cooba.

Acacia burkittii — Crochet-needle Bush.

Lomandra effusa — Scented Mat-rush, with its prominent clusters of pistillate flowers.

Codonocarpus cotinifolius — Native Poplar with its bell-like fruits.

Pittosporum phillyreoides — Weeping Pittosporum showing fruits of yellow capsules and red seeds.

Echium plantagineum — Salvation Jane in some places lined both sides of the road with beautiful blue flowers.

On the white sandy shores of dry Lake Popilta: *Lavateria plebeia* — Austral Hollyhock.

Ajunga australis — Austral Bugle showing individual plants with either white, pink, blue or purple flowers.

Nicotiana suaveolens — Native Tobacco.

Wahlenbergia gracilis — Native Blue-bell.

On excursions in and around Broken Hill we were grateful for the help of the President, Mr R. H. Mew, and Mr and Mrs J. E. Baker and other members of the Barrier Field Naturalist Club. References used were Albert Morris's "Plant Life of the West Darling" — a book compiled and published by the Barrier F.N.C., and Plant Check Lists for Mootwingee Reserve and National Historic Site and the road to Menindee Lakes. The Superintendent of the Kinchega National Park Menindee supplied us with information sheets on the fauna, flora and history.

Some plants noted at *UMBERUMBERKA;*

Lysiana exocarpi — Harlequin Mistletoe with glistening red berries, and its host plant was Acacia tetragonophylla — Dead Finish.

Amyema preissii — Wire-leaf Mistletoe with transparent pinkish white berries, and its host plants were Acacia victoriae, and A. tetragonophylla.

Trichodesma zeylanicum — a member of the Borage family, with large-sized forget-me-not blue flowers on approximately two-foot high stems.

THACKARINGA HILLS

Sida virgata — a shrub with many yellow flowers, common on some sandy hillsides.

TRIPLE CHANCE MINE area.

Eremophila alternifolia — a shrub with pink flowers spotted with red.

Pterostylis mitchellii — Greenhood Orchids in bud, and their rosettes of leaves.

Parmeliopsis semiviridis var. major — a wandering Lichen existing without any attachment to the ground. It rolls up when moisture is not available and is carried about by the wind. When rain falls it uncurls and commences life anew.

Ephemeral Plants were exciting to find. Observation while standing in one place revealed Helipterum species, Alyssum linifolium, Brachycome lineariloba, Ixiolaena leptolepis, Isoetopsis graminifolia and others, growing a maximum of about two inches high, and all in flower.

MOOTWINGEE. on the roadside:

Flindersia maculosa — Leopard Wood, a tall conspicuous tree with spotted bark.

Ptilotus polystachyus — Long-tails, many with the typical green inflorescences, and some with red inflorescences.

In the reserve:

Scaevola spinescens — a perfumed Fan Flower.

Acacia aneura — the silver form of Mulga laden with pods.

Eremophila duttonii — showing its large persistent calyx.

Eremophila sturtii — aromatic Turpentine Bush with its lilac coloured flowers.

Dodonea attenuata and *D. lobulata* each bearing pink to red winged fruits.

Isotoma petraea — white flowers.

Eriostemon linearis — an uncommon Waxflower.

Mary K. DOERY.
Melbourne Field Naturalists.

The Origin of Generic Names of the Victorian Flora

Part 3 — Latin, Greek and Miscellaneous

(Continued from page 181 in a previous issue)

By James A. Baines

Typha. Gk typhe, name of a plant used for stuffing beds, such as Cat's-tail. *T. angustifolia* is called Bulrush in Victoria but Narrow-leaved Reedmace in England, where *T. latifolia* is usually called Bulrush, but Reedmace by those who call *Scirpus lacustris* the Common Bulrush. The biblical bulrushes, where the infant Moses was hidden, were almost certainly *Cyperus papyrus*, Papyrus (the source of paper). W. W. Skeat thinks the word means stem-rush, from Danish bul, stem (cognate with bole), while recognizing that it could have come from bull because of large size of flowering head. The genus gives its name to family Typhaceae. Our species are now in 3 taxa.

***Ulex.** The classical Lat name for Gorse or Furze. **U. europaeus*, a prickly pest in many areas, is known nearly always in Victoria as Gorse, the other English names, Furze and Whin, being rarely heard here. Fam. Papilionaceae.

***Ulmus.** The Lat. name for the elm. The Dutch Elm suckers and persists, but the Common or English Elm is an ornamental tree not strictly naturalized.

Uncinia. Lat. uncinatus, barbed (from uncus, a hook). Victoria has 3 species, all native, and known as different kinds of hook-sedge. Family Cyperaceae.

***Urospermum.** Gk oura, tail; sperma, seed; alluding to the long-beaked achene. **U. picroides* is native to Mediterranean Europe, and is naturalized in Vic. only at Mt. Arapiles, but is more widespread in S.A. The specific epithet indicates its resemblance to *Picris* (Ox-tongue); both genera are composites.

Urtica. The classical Lat. name of the nettle. Victoria has 1 introduced species, **U. urens*, Small or Dwarf Nettle, Lesser Stinging Nettle, and 1 native species, *U. incisa*, Scrub Nettle. The genus gives its name to family Urticaceae, which includes the Queensland Stinging Trees or Gympie-gympie, *Dendrocnide* (syn. *Laportea*).

Utricularia. Lat. utriculus, a small leathern bottle (diminutive of uterus, a bag, hence belly, womb); alluding to the minute bladders. Victoria has 4 species, *U. dichotoma*, Fairies' Aprons or Purple Bladderwort, and 3 other species known as different kinds of bladder wort. The genus is in family Lentibulariaceae.

***Vaccaria.** Lat. vacca, cow; because the plant was considered good fodder for cattle. Our species, **V. pyramidata*, is known as Cow Soapwort (from its former generic name, *Saponaria*, to which it is very close) or Cow Basil (as given in Polunin's 'Flowers of Europe'). The genus is in Caryophyllaceae.

***Valerianella.** Diminutive of *Valeriana*, Valerian, which the plant resembles; they are both in family Valerianaceae. Valeriana was the classical Lat. name. Our species, **V. eriocarpa*, although known as Italian Corn-salad, is native to Western as well as Mediterranean Europe. The Lat. name probably came from valere, to be healthy, in allusion to the medicinal use of valerian for nervousness and hysteria. Our other species, **V. locusta*, Lamb's Lettuce, is also known as Corn Salad.

(To be continued)

Field Naturalists Club of Victoria

Annual General Meeting
Monday 12 May 1980

The Minutes of the previous Annual General Meeting were read and confirmed.

The President, Dr B. Smith, read the annual report for the year 1979/80. He made mention of the many activities already held and planned for the Centenary year, in particular the Centenary meeting, which was opened by the Club's Patron, His Excellency, Sir Henry Winneke, and at which the main address was given by Dr. J. H. Willis. Other important events during the year were the presentation of the Natural History Medallion to Miss Helen Aston, and of Certificates of Honorary Membership following 40 years of continuous membership, to Professor J. S. Turner, Mr Lamrock and Mr N. Lothian. The President also mentioned the many Group and Club activities, including an additional excursion instituted for the more active members, the continued high standard of the Naturalist, and the hard work and dedication of the Council and Executive.

The Treasurer, Mr D. McInnes, presented his report, with mention of increased membership subscriptions, the cost of printing the Naturalist, sales of back issues and books, and expenditure in relation to the Natural History Medallion.

Elections were then held for members of Council and for the various Offices for the following year. Among those elected were Dr. Brian Smith for a further term as President, Mr J. Martindale as Vice-President and Miss W. Clark as Secretary. The position of Treasurer remains vacant.

Botany Group

The Botany Group were hosts for the evening and presented the main topic, "Ferns". Miss Lester gave an introductory talk on fern reproduction by alternation of generations. This was followed by a large number of slides shown by Mr A. Morrison of both common and rare ferns and some close relatives of ferns.

Correspondence was tabled by the Secretary, and forthcoming excursions and activities were announced by group representatives.

There were several varied exhibits. Mr Morrison showed a prickly rasp fern (*Doodia aspera*) and Mr D. McInnes both a rotifer colony, under the microscope, and eggs of a moth. Miss Carstairs reported the sighting of a white koala near Walkerville, and Mr I. Bates spoke of his observations of caterpillars being parasitized by wasps.

Microscopy Group

The evening's programme was prepared and hosted by the Microscopy Group. Several members had very interesting exhibits and each gave a detailed description of them. Mr D. McInnes had very thin sections of rocks under different lights to show the crystals and the colours. The head of a mosquito, shown by Mr I. Bates caused considerable interest. Other exhibits of Mr Bates were pollen grains, a *Paropsis* beetle and wasps. Mr H. Bishop's exhibit was spines of sea urchins, which vary in structure being sometimes hollow and sometimes solid, and which are darker in colour the deeper in the water they are found. Freshwater organisms were shown by Mr D. Wentworth. Some of these are anchored to water weeds by fine threads, and all possess a mastex to grind food. Two early microscopes dated approximately 1770 and 1870 were demonstrated by the Group's President, Mr J. Dawes, who spoke about the early history of microscopes. Film was shown by Mr P. Gennery of aphids taken under the microscope.

(Continued from page 186)

Second Thursday — Botany Group.
Thursday, 13 November. Speaker: Dr P. A. Braody. Subject: Life in the ice and natural history of Antarctica.
At the Conference Room, the Museum, Melbourne, at 8.00 p.m. Good parking — enter from Latrobe St.

First Monday — Marine Biology and Entomology Group.
Monday, 1 December. ABC meeting. Supper.

GROUP EXCURSIONS

All FNCV members are invited to attend Group excursions.

Botany Group — last Saturday.
Saturday, 25 October. Langwarrin and Cribb Point.
Saturday, 29 November. Gembrook and Beenak.

Day Group — third Thursday.
Thursday, 20 November. Cherry Lake and beach walk, Seaholme. Meet at Altona station (south side) 11.30 a.m. Williamstown train leaves Flinders St at 10.46 a.m. (platform 6 or 7). Change at Newport. Bring binoculars. Leader: M. McKenzie (68 3119).
No December meeting.

NEW BOOK PUBLISHED IN SEPTEMBER
"Australian Mammals"
A Field Guide for New South Wales, Victoria, South Australia & Tasmania.
by Jack Hyett & Noel Shaw
270 pages Hard Cover 130 Illustrations
190 species of Native and Introduced Mammals
Price $16.95 (Discount to Members) Postage 50km $1.00 Vic. $1.40
Interstate $2.40 Order from Sales Officer F.N.C.V.
A review of this book will be published as soon as possible.

Modern Victorian vascular plant checklists now available

Beauglehole, A.C., 1980. **'Victorian Vascular Plant Checklists — 13 Study Area and 24 Grid Distribution'.**

Available from Portland Field Naturalists Club, PO Box 470, Portland, Victoria 3305, for $6 a copy including postage.

This publication of 210 pages comprises two up-to-date Checklists:

(A) The distribution according to the Victorian Land Conservation Council 13 Study Areas with Families alphabetical within the four vascular plant groups — ferns, conifers, monocotyledons and dicotyledons. There are 182 Families, 959 Genera and 3542 species involved.

(B) The distribution according to the 24 Major Grids with Genera and species alphabetical for convenience. Approximately 7700 individual Major Grid records have been added in the past decade.

In both Checklists computer numbers and both scientific and common names are given to assist a wide spectrum of interested observers and recorders.

Comparisons of Study Areas and Major Grids highlights the value of plant recording for distribution and conservation purposes.

Both Family and Genera Index are provided.

The large Victorian Map clearly illustrates the 13 Study Areas, 24 Major Grids and approximately 1000 Minor Grid boundaries.

Beauglehole's earlier publications 'The Distribution and Conservation of Native Vascular Plants in the Victorian Mallee and Corangamite-Otway areas of Victoria' are available from the same address for $5 per copy.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

Patron:
His Excellency the Honorable SIR HENRY WINNEKE, KCMG, KCVO, OBE, KStJ, QC.

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MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

Subscription rates for 1980

Metropolitan	$12.00
Joint Metropolitan	$14.50
Country Members and Retired Persons	$10.00
Joint Country and Joint Retired	$12.00
Junior	$2.50
Subscription to Victorian Naturalist	$10.00
Overseas Subscription to Victorian Naturalist	$12.00
Individual Journals	$1.75

All subscriptions should be made payable to the Field Naturalist Club of Victoria and posted to the Subscription Secretary.

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29 JAN

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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, the Domain, South Yarra.

Monday, 8 December, 8.00 p.m.
Programme hosted by the Hawthorn Junior FNC.

Monday, 12 January, 8.00 p.m.
Members night. Intending speakers (particularly those with slides) should contact Brian Smith or Wendy Clark beforehand.

New Members —
November/December meetings.

Ordinary
Barrie Bolton, 4 Viewbank Rd, Glen Iris.
Mark Cavill, 202 Monbulk Rd, Emerald.
David Cowan, 52 Roberts St, Frankston.
Maire Devanne, St Andrew's Hospital, Cathedral Place, East Melbourne.
Julien Duclos, 17 Bolton Ave, Hampton.
David Frusher, 432 Hawthorn Rd, South Caulfield.
Peter Gell, 22 Kenmace St, Mont Albert North.
L. Hanks, 484 Abbotsford St, North Melbourne.
Sigrid Kraemers, Dept. of Geography, Melbourne University.
Ian Mansergh, 7 Hallcroft St, East Hawthorn.
William Norris, 4/25 Vickery St, Bentleigh.
Donna Prest, 20 Yardley St, Maidstone.
Stephen Reilly, 94 Collins St, Thornbury.
Bruce Rigby, 22 Victoria Ave, Canterbury.
Catherine Zerbe, 65 Anderson's Creek Rd, East Doncaster.

Joint
Kate Burchell & M. Canaider, 100 Napier St, South Melbourne.
Nicholas Dudley & Jacqui Scott, 16 Kumala Rd, Bayswater.
Mr M. H. & Mrs U. N. Griffiths, 19/166 West Toorak Rd, South Yarra.
Bryan & Margaret Walker, 4 Oxford St, Malvern.

Country
Susin Churchill, 100 Hull Rd, West Pennant Hills, N.S.W.

FNCV EXCURSIONS

Saturday, 17 — Sunday, 25 January. Mt Kosciusko. See September/October Naturalist for details.

Sunday, 1 February. Flinders — Marine biology. Leader: Dr Brian Smith. Bring containers for specimens. The coach will leave Batman Ave at 9.30 a.m. Fare $6.50. Bring two meals.

Saturday, 7 — Monday, 9 March. Castlemaine. This is the weekend when the Victorian Field Naturalists Clubs Association has its annual get-together, this year to be hosted by the Castlemaine Field Naturalists Club. Short half-day excursions have been prepared as well as evening meetings. Further details will be given in the next Naturalist and at General Meetings. A coach has been chartered for the weekend and accommodation booked on a B & B basis at a cost of $60.00 per person for the weekend. Bookings should be made with the Excursion Secretary accompanied by a $10.00 deposit. The coach will leave Flinders St from the Gas and Fuel Corporation at 8.30 a.m. on Saturday, 7th. Bring a picnic lunch.

Preliminary notices:

The Arnhemland-Kimberleys safari mentioned in the last Naturalist is booked out but it is planned to run a second trip starting 5th September, 1981, with a similar itinerary.

Special study trips: Contact Wendy Clark for details (A.H. 859-8091).

Saturday, 21 — Sunday, 22 February. Bat-catching expedition to the Daylesford region. Bring all camping gear and food.

Sunday, 22 March. Fossil excursion to limestone quarry at Geelong.

(Continued on page 271)

29 JAN 1981

The Victorian Naturalist

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Editor: Robert L. Wallis
Assistant editor: F. Dane Panetta
Editorial Committee: H. Cohn, R. Kent, B. Smith

Cover illustration: Spotted Grass Frog *(Limnodynastes tasmaniensis)* Photograph by R. Gaymer

The Frogs of French Island and Phillip Island

By M. J. Littlejohn †

Introduction

The terrestrial faunas of continental islands often are of considerable biogeographic interest for they may show the effect of area on taxonomic diversity, or may reflect the changes in the fauna of the adjacent mainland after the formation of the islands following the late Pleistocene eustatic rise in sea level. Accordingly, the amphibian faunas of the two large islands in Westernport Bay: French Island (16835 ha) and Phillip Island (10100 ha) were investigated and compared with that of the coastal areas on the adjacent mainland.

Both islands are of low relief (mostly below 150 m), and are located between 145° 05' and 145° 30' east longitude and between 38° 15' and 38° 35' south latitude. The average annual precipitation in this area ranges from 700 mm to 900 mm with rain in all months, but with a slight winter maximum (Central Planning Authority 1968). Mean maximum and mean minimum temperatures at Cowes (on Phillip Island) are 18.8°C and 10.3°C respectively; January and February are the warmest months (mean maxima 24.2°C and 24.5°C), and July and August are the coldest months (mean minima 6.9°C and 7.3°C) (Central Planning Authority 1968). The natural vegetation associations on Phillip Island have been greatly modified by the activities of European man, and very few undisturbed areas remain (Seddon 1975). However, about half of the area of French Island is crown land, and has been retained in a relatively unmodified state (Land Conservation Council 1973).

Methods

Most of the distributional data were obtained by making road traverses in a vehicle when calling frogs can be identified by their characteristic male breeding calls (Littlejohn and Martin 1969). Previously available information was summarized by Brook (1979), and only a few records were listed for French Island and Phillip Island. Additional information was obtained from general collecting in the study areas.

While Phillip Island was visited on several occasions, mainly in the autumn and spring, French Island was only visited once (October 7-11, 1979), when extensive transects were made through most of the accessible areas of the island. Data for the adjacent mainland, additional to those summarized by Brook (1979), were obtained by making transects in the autumn and spring during 1979 and 1980.

Results

French Island

Three species: *Litoria ewingi*, *Limnodynastes dumerili insularis* and *Ranidella signifera*, are common and widespread on the island, and were calling strongly and breeding during early October. Series of specimens of each of these species were obtained at a dam, 0.6 km W of McLeod. Two adults of *Litoria raniformis* were collected 1.0 km NE and 3.5 km W of McLeod, at the eastern end of the island. *Crinia haswelli* was heard calling at six localities in the central and eastern areas of the island (1.5 km S of Clump Lagoon; 1.0 km SW, 2.0 km SSW and 3.5 km SSE of Mount Wellington; 0.6 km W and 1.0 km NE of McLeod), and five specimens were obtained. Four specimens of *Pseudophryne semimarmorata*, an autumn-breeding species (Brook 1980), were found in the McLeod farm area; this taxon was the only species recorded from the island by Brook (1979).

Phillip Island

Four species: *L. ewingi*, *Litoria*

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verreauxi, *L. d. insularis* and *R. signifera* occur commonly over most of the island. They utilize farm dams, roadside drains, and natural swamps for breeding, and strong choruses of all species were heard in the spring. Adults of *L. raniformis* were seen at farm dams and by roadside drains in the Rhyll-Cowes area, and this species presumably occurs elsewhere on the island. No other species of anurans were detected, even though repeated transects were made through apparently suitable areas during their breeding seasons. Brook (1979) indicated that three species occur on Phillip Island: *L. ewingi*, *L.d. insularis* and *R. signifera*.

Mainland Coastal Areas of Westernport Bay

All seven species found on the islands also occur on the adjacent mainland (Brook 1979, Littlejohn unpublished observations), together with three additional species: *Geocrinia victoriana*, *Limnodynastes peroni* and *Limnodynastes tasmaniensis* (southern call race) (Brook 1979, Littlejohn unpublished observations). Thus far, *C. haswelli* has only been found in a limited area at the southern edge of Hastings (Littlejohn unpublished observations). The autumn-breeding species, *G. victoriana*, while common in the wetter and elevated regions of western Gippsland and the northern Mornington Peninsula, has only been found close to the coast between Grantville and The Gurdies (Littlejohn unpublished observations). The remaining eight species are common and widespread in coastal mainland areas of Westernport (Brook 1979, Littlejohn unpublished observations).

Discussion and Summary

The anuran species present on French Island, Phillip Island, and the adjacent coastal mainland are summarized in Table 1. There are six species on French Island, and five species on Phillip Island, with four species being common to both islands. *C. haswelli* and *P. semimarmorata* are found only on French Island, and *L. verreauxi* only on Phillip Island. Ten species occur on the adjacent mainland, including *G. victoriana*, *L. peroni* and *L. tasmaniensis*, which are not found on either island.

It is possible that *G. victoriana* is part of the fauna of French Island, because the island was only visited in spring; this autumn-breeding species is secretive out of its breeding season, and thus could have been missed. Only observations during the autumn (April-May) can decide this question. It is considered most unlikely that *L. peroni* and *L. tasmaniensis* occur on either island, or that *C. haswelli* and *P. semimarmorata* are on Phillip Island, because surveys were made during the breeding seasons of these species. It is interesting to note that *P. semimarmorata* was heard in chorus at San Remo, but was not heard on the eastern end of Phillip Island on the same evening, even though

Table 1
Anuran species composition of the islands and adjacent mainland of Westernport Bay

Species	French Island	Phillip Island	Adjacent Coastal Mainland
Crinia haswelli	+	-	+
Geocrinia victoriana	-	-	+
Limnodynastes dumerili insularis	+	+	+
L. peroni	-	-	+
L. tasmaniensis	-	-	+
Litoria ewingi	+	+	+
L. raniformis	+	+	+
L. verreauxi	-	+	+
Ranidella signifera	+	+	+
Pseudophryne semimarmorata	+	-	+
TOTAL	6	5	10

apparently suitable habitats were present.

It has been estimated that the drowning of Westernport Bay began about 10,000 years ago with the recovery of the world sea level after the last glacial period of the Pleistocene Epoch, and that the present coastal configuration was assumed about 5,000 to 6,000 years ago (Marsden and Mallett 1975). The absences of the very common mainland species, *L. tasmaniensis, L. verreauxi* and *P. semimarmorata* on one or both islands are particularly interesting, for apparently suitable habitats are present (Littlejohn unpublished observations). *L. tasmaniensis* and *P. semimarmorata* occur on Flinders Island, and *L. peroni* on King Island (Littlejohn and Martin 1974), so that they clearly were in the Bass Strait area at the time of lower sea levels. These absences are difficult to explain. Recent historical changes may account for the elimination of these species from the island faunas; however, the species occur in similarly-modified habitats on the adjacent mainland (Littlejohn unpublished observations). Presumably, chance effects have operated, based on the relatively small sizes of the islands and associated small population sizes of species of the endemic fauna, making local extinction a more likely event (MacArthur and Wilson 1967).

Littlejohn and Martin (1974) have summarized the available information on the relationship between number of species and area of an island for other middle-latitude continental islands of Australia. Flinders Island (1329 km^2) and King Island (1101 km^2) each have six species of anurans, Maria Island (96 km^2) has five species, and Deal Island (ca 16 km^2) lacks amphibians. The potential number of species available to colonize these islands was estimated to be ten (Littlejohn and Martin 1974), the same number available to colonize French Island and Phillip Island (Table 1). French Island (168 km^2) with six species, and Phillip Island (101 km^2) with five species, are thus comparable to Maria Island, which was isolated from Tasmania at about the same time as the Westernport islands.

Acknowledgements

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The Orange-bellied Parrot: Species Endangered by Improperly Assessed Development

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VALDA DEDMAN *
CHRIS DOUGHTY #

Introduction

Study Objectives

The study was designed to:

i) develop a simple method of assessing the status of and to propose management strategies for an endangered species;
ii) involve naturalists groups, government and private agencies;
iii) determine habitat/behaviour interrelationships of the Orange-bellied Parrot and related *Neophema* Species.

Orange-bellied Parrot: Life History

The Orange-bellied Parrot (*Neophema chrysogaster*) (hereafter referred to as "The Parrot") is not a well known species. Jarman (1965) Forshaw (1969), Milledge (1972), Loyn and Chandler (1978) and Lane *et al*, (1979) have prepared valuable reviews of this Parrot's biology.

Most individuals of this Parrot are presumed to undertake a yearly return migration from Tasmania to the mainland. About March to April a group of the Parrots migrate from some of the breeding grounds in south west Tasmania (Brown & Wilson, 1980) to probably either King Island and/or Victoria and South Australia. The Parrot(s) arrive in April or May at King Island and usually depart in July (Jarman 1965).

However, Hinsby (1946) states the Parrot can still be found on the West Tasmanian Coast in winter. In October, the Parrots migrate in groups from areas in Victoria presumably to Tasmania via King Island.

Large numbers ("several thousand") of the Parrot have been seen in spring to summer of 1836, 1886 and 1918 (Ashby and Morgan in Jarman (1965)). These appear to be very rare eruptions of the population in coastal South Australia. (Ashby and Morgan in Jarman (1965)). This other population may breed in South Australia, (L. Delroy, pers. comm.) and may or may not migrate to Tasmania. In the Sydney area of New South Wales, the Parrot has unfortunately not been reliably observed for over 70 years and is presumably extinct here, (Jarman 1965; Sharland 1974).

Parrot Behaviour

The Parrot can be distinguished with some field experience from other *Neophema* Parrot species. Distinguishing features of the Parrot include:

— the warning call: a rapid 'chitter-chitter', close to a buzzing sound;
— the bright green, grass coloured back, particularly in the male;
— the lack of yellow near the pale/dark blue patches over the eye;
— less dark blue (about 2 mm) than pale blue on the edge of the wing.

The Parrot's feeding, roosting, resting, calling, flying, breeding, and other behaviour has been very little described.

Breeding in the wild has been poorly documented with only few, uncertain natural records. The Parrot was thought to breed in nests on the ground (Morgan in Jarman (1965) but tree hollows (Sharland and Hinsby in Jarman (1965); Belcher 1902; North 1912; Brown & Wilson 1980) appear to be the norm.

In captivity, the Parrot was bred successfully in Australia, (Gokel 1975) and in Holland (Swaenepoel, 1972).

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Figure 1. The Orange-bellied Parrot *(Neophema Chrysogaster)* Photograph: Cyril Loubshare.

Other activities such as a soft tinkling call in flight or chirping when feeding are little described (Jarman 1965; Forshaw 1974).

Habitat

Most sightings of the Parrot have been coastal in the three states. Very few inland sightings have occurred and are generally no more than 20-50 miles inland in lake or woodland areas. Additional possible inland sightings in Victoria have been reported at Port Campbell in 1979 and Lake Reeve (P. Goldstraw, pers. comm.). Previously, Jarman (1965) indicated the Parrot may have been seen at Woolsthorpe, Naringal and Lake Colac.

In South Australia and Victoria, the Parrot's prime habitat has been coastal salt marsh, adjacent grassland, and introduced plant communities. In Tasmania, the Parrot is regularly seen in coastal grassland, heath and eucalypt woodlands (Milledge 1972).

Saltmarsh Community: Victoria

The distribution of the Saltmarsh Shrubland Community was surveyed in Victoria and found to be primarily coastal and occasionally inland in the Mallee (Carr *et al* 1979; Willis 1970, 1972).

However, *Arthrocnemum arbusculum* — dominated saltmarsh totals only a few hundred hectares from Breamlea to Corner Inlet (M. Barson, pers. comm.). Saltmarsh of other types, i.e. *A. halocnemoides* occurs elsewhere on the southern Australian coast and on various offshore islands (Specht *et al* 1974; Barson 1976; Barson & Calder 1976; Saenger *et al* 1977; Butler 1977; Kirkpatrick 1977; Kratochril 1972).

In general, this type of Salt Marsh community is limited to a zone of about two hundred metres inshore and is about 1.2 metres in height if dominated by *A. arbusculum* and 0.3 m high if dominated by *A. halocnemoides*. Saltmarsh plant species have a very specific salinity requirement related to elevation, rainfall, tidal and ground water influences (Clarke & Hannon 1967, 1969, 1970, 1971).

South Australia/Tasmania Saltmarsh Community:

The Parrot prefers coastal habitat (Jarman 1976; Milledge 1972; Loyn & Chandler 1978). There would be about 100 and 400 km of coastline in South Australia and Tasmania with a potential habitat of thousands and several thousands ha., respectively. Only a small proportion is apparently used as evidenced by sightings of the Parrot.

Methods

There were two objectives to the study and hence there were two field groups, designated Habitat and Parrot.

These parties worked simultaneously on each specific sighting. For each sighting, the following was recorded on a proforma:

Habitat Data and Mapping

- the plant species within a three metre radius and vegetation association type
- the degree of flowering and seeding of each species and in particular, species on which the Parrot(s) fed
- the height of each species and the Parrot(s) height range above the ground
- the time of day, general weather and other physical characteristics

1:10,000 or 1:2500 scale maps were used for habitat mapping. These were prepared from blow-ups of Victorian Crown Lands & Survey Department Black and White Aerial photographs. From this and ground observations, vegetation was identified (Bridgewater 1974; Willis 1970, 1972) and classified according to a combined Specht/Land Conservation Council of Victoria type, (Specht *et al* 1974; Land Conservation Council of Victoria 1973). The species composition and structure and approximate area of each habitat association type was mapped from aerial and ground observations.

Parrot Study

The following was also recorded on a pro forma —

- number(s) and sex(es) of individual(s) group(s)
- activity: feeding, roosting, flying (direction and height above ground) breeding, resting, etc.
- length of time spent on this activity and whether human observation had any effect
- any other comments

Field groups met at a study site in the morning and the habitat was covered in a standard direction by one to three groups of individuals, walking, wherever possible, with only 15 metres between them. An experienced observer accompanied each group and if possible, was between each observer. If a Parrot was sighted then the group recorded data for up to 20 minutes and a 150 cm coded wooden stake was left at a site. Disturbance of Parrots was minimized and any disturbance due to survey was noted.

This method was adapted for use from a study on the Ground Parrot (*Pezoporus wallicus wallicus*) in N.S.W. (Forshaw & Fuliagar, pers. comm.).

The various study reports from each

date were then confirmed and compiled as soon as possible.

Plant specimens which were difficult to identify were forwarded to the National Herbarium of Victoria. A summary of study dates and localities is given in Table 3.

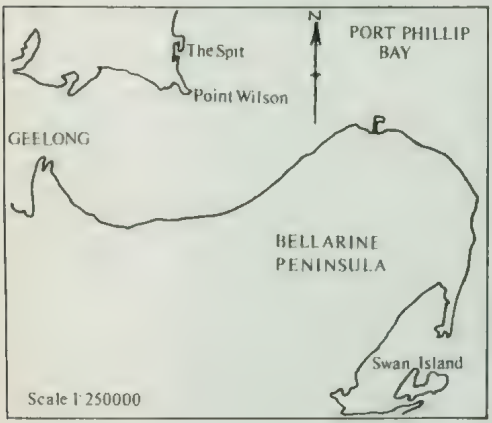

Figure 2.
Location of The Spit (Pt. Wilson) and Swan Island.

Results

Feeding Behaviour

In half of the sightings (Table 1) the Parrot was observed in behaviour classified as feeding. A very large proportion — about 60% of the feeding sightings were on *Arthrocnemum arbusculum* (Shrubby Glasswort).

About 30% of the feeding sightings were from the grassland association. The Parrot did feed on 22 plant species overall. In 1978 only a small proportion of the feeding was on introduced species, mainly grasses. In 1979, a very large proportion of the feeding was on introduced grasses (Table 1 & 2).

In most sightings the Parrot fed on only 2 or 3 plant species (Tables 1 & 2). The Parrot fed either on *A. arbusculum* individuals of an average height of about 1.25 — 1.86 metres, or on the ground.

In 1979, feeding patterns reversed and the Parrot fed in the Saltmarsh association only 29% of the time and fed in the grassland association 65% of the time.

Over-night Roosting Activity

The Parrots were seen flying at heights of about 100-200 m when arriving at Swan Island. This occurred twice in the morning from a south-easterly direction and once leaving at night in that direction. A similar observation of this Parrot leaving at dusk was recorded at the Spit (Chandler pers. comm.).

Resting, Flying, Calling and Other Activities

Resting and Flying behaviour were about equally represented in the remaining two quarters of the sightings. Most flights were 50 m or less off the ground (Table 1). In only four sightings overall did the Parrot vocalize either the rapid "chitter-chitter" buzzing warning call, a soft chirping when feeding or tinkling sound in flight. In two sightings, one Parrot was seen preening by water and six Parrots were observed near a water hole at Swan Island but not drinking.

No trends in these sightings regarding the Parrot's behaviour in relation to the month, time of day or percent flowering/seeding of species were found. In about half of the sightings there was some flowering/seeding present (Table 4).

No substantial differences between behaviour and habitat interrelationships were found between the Spit and Swan Island. Clearly, a study of this type should be several years in duration.

Parrots migrated from The Spit after 24th September, 1978, earlier than from Swan Island. In 1979, migration at Swan Island commenced about the beginning to middle of October.

Possible Sex/Immature Ratios

Data was available for a few sightings at two locations. In one Parrot, a mixed pattern of yellow and green feathers was noted on the back. A similar unsexed specimen was noted in the Victorian National Museum collection. The male/female ratio observed at The Spit was approximately 1:1 (table 4). On Swan Island thirteen males were seen to

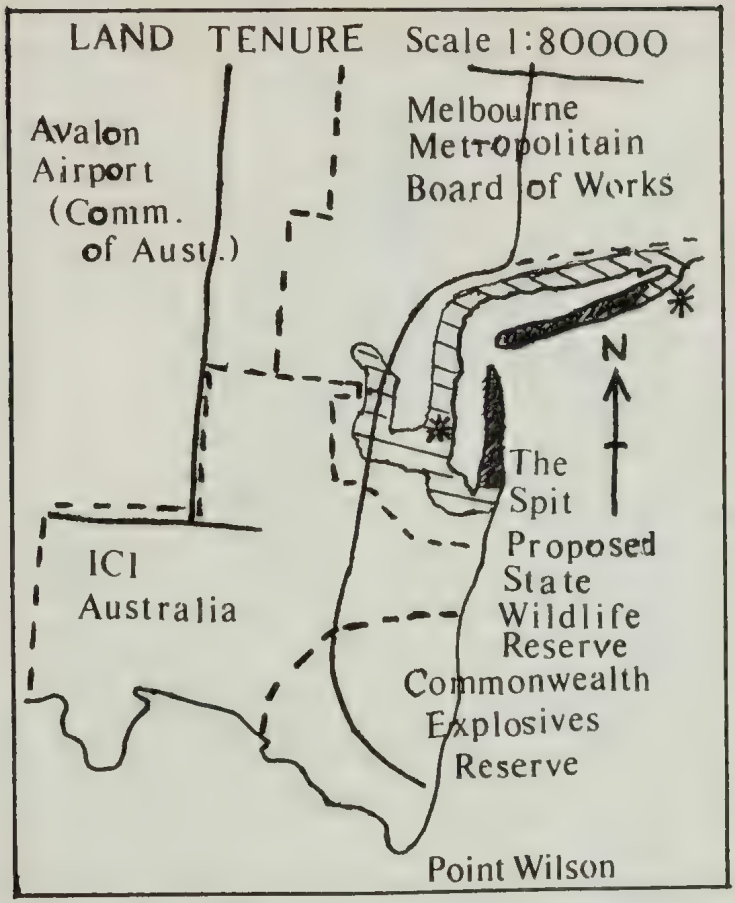

Figure 3. The Spit locality: vegetation and sightings. See text for explanation of symbols.

possibly 8 or 9 females and one possible immature (Table 4).

Habitat Mapping

The three types of habitat mapped at The Spit (Figure 2) are listed in Table 5. Habitat types at Swan Island were fairly similar. Generally speaking there was more native Grassland present near the Spit than at Swan Island (Figure 3), but more Sand dune/Strandline Vegetation present at Swan Island. Precise figures are not yet available.

Habitat Utilization

The sightings were concentrated in the south-western and north-western sectors of The Spit at areas marked with an asterisk in Figure 2.

The sightings on Swan Island were as dense per unit area (32 sightings/ha) as those at The Spit but were found only in the western sector (marked with an asterisk) in 1978. In 1979, some sightings were also made at the area marked with an X.

Discussion

Field Identification of *Neophema* species

In the case of Orange-bellied Parrots, it may now be possible in the field to distinguish the female and juvenile. There are few clear cut differences except that the adult male is

Table 1 — Percentage of sightings of Orange-bellied Parrot related to activity/plant species: 1978

VEGETATION TYPE/ASSOC.	FAMILY/ SPECIES	FEEDING	FLYING	ROOSTING	CALLING	FLUSHED	TOTAL
Saltmarsh SHRUBLAND	*Arthrocnemum arbusculum*	28.6	12.6	13.2	2.3	1.5	58.2
	Suaeda australis	2.3	0.6	1.9	2.3	0.6	7.7
	Salicornia quinqueflora	0.7				0.4	1.1
	Salomus repens	1.2					1.2
	Frankenia pauciflora	0.5				0.4	0.9
	Distichlis distichophylla	1.2					1.2
ASSOCIATION TOTAL							70.3
Remanent & Introduced WOODLAND/ GRASSLAND	*Acacia sp.*	2.3					2.3
	**Cupressaceae sp.*			2.3			2.3
	**Stenotaphrum Secundatum*	1.2					1.2
	Poa annua	0.9					0.9
	Poa poiformis					0.6	0.6
	**Sherardia arvensis*	0.1					0.1
	**Cerastium glomeratum*	0.9				0.4	1.3
	**Trifolium dubium*	1.2				1.1	2.3
	Triglochin mucronata	0.7					0.7
	Plantago varia					0.8	0.8
	Disphyma austrate					0.6	0.6
	Spergularia media	0.7				0.2	0.9
	Graminae sp. (Unknown)	4.5					4.5
	**Brassica sp.*			0.3			0.3
	Cotula coronopifolia			0.3			0.3
	Rhagodia sp.			0.3			0.3
	**Rumex sp.*			0.3			0.3
	Lepidium					0.2	0.2
	**Sonchus oleraceus*					0.2	0.2
SAND DUNE & STRANDLINE							20.1
	Atriplex paludosa	2.4	2.3	3.3			7.0
	A. cinera					0.3	0.3
	Leptospermum sp.	1.2					1.2
							8.5
		50.6	15.5	21.9	4.6	7.3	99.9

* INTRODUCED SPECIES

DATE: 1979

VEGETATION ASSOCIATION	FAMILY/ SPECIES	FEEDING	FLYING	ROOSTING	CALLING	OTHER	TOTAL
Saltmarsh	*Arthrocnemum*	10.8	10.8	—	—	8.1	29.1
Grassland	**Graminae*	54	5.4	—	—	5.4	64.8
	Poa sp.	—	2.7	—	—	—	2.7
	**Arctotheca calendula*	2.7	—	—	—	—	2.7
							100

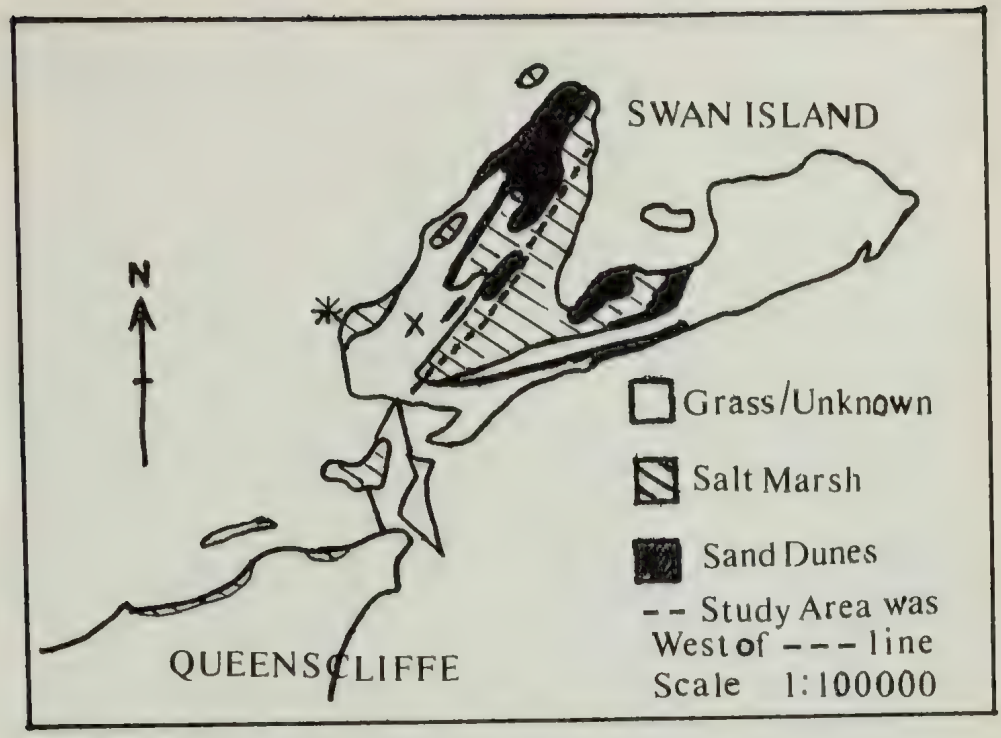

Figure 4. Swan Island locality: vegetation and sightings.

distinguishable from the female and juveniles. However, a pale yellow underwing bar seems to be only found in females and juveniles. The bars are much reduced and not so bright in the female, (P. Brown, pers. comm.)

Other *Neophema* species, e.g. the Blue-wing Parrot are similar but even in poor weather conditions these 2 species can be observed and differentiated in the field from about 20-35 m.

Characteristics of Immature *Neophema* Parrots — Underwing Bar

It was interesting to note the presence of an underwing bar in flight and a horn/orange coloured beak in one Parrot, possibly indicating an immature (A. Isles pers. comm; Forshaw 1974). Loyn & Chandler (1978) observed the presence of 3 immatures in about 92 Parrots.

Table 2 Locality and the number of vegetation species on which the Parrot was observed

DATE: 1978	THE SPIT	SWAN ISLAND
30th July	18	—
19th August	3	3
3rd September	2	—
15th October	3	5
19th October	N/A	2
3rd November	—	16
2nd December	—	—

Table 3 Average Group size and range of number of parrots seen: 1978-79

DATE (1978)	GROUP SIZE LOCALITY THE SPIT	SWAN ISLAND	OTHER* (*all O sightings)	AVERAGE GROUP SIZE NO. OF SIGHTINGS SP	SW
30 July	2 - 11	N.D.	Killarney Beach Port Fairy	4.3/8	N.D.
19 August	2 - 17	3 - 15	Edward's Pt. Killarney Beach Port Fairy	5.4/7	7.6/6
3 September	2 - 5	—	Killarney Beach Port Fairy	4.6/3	—
24 September	1 - 12	3 - 10	Killarney Beach Port Fairy Pt. Henry	4/3	7.7/9
15 October	—	2 - 15	—	—	3.6/14
			Cumulative Av.	4.7	5.7
5 November	—	2	—	—	1.5/2
			Overall av.	4.7/21	5.4/31

DATE: 1979	SWAN ISLAND GROUP SIZE	AVERAGE GROUP SIZE/ NO. OF SIGHTINGS
29 April	—	—
3 June	—	—
1 July	—	—
5 July	1 - 19	8.7/6
29 July	3 - 15	9.8/6
30 July	17	/1
31 July	10	/1
1 August	5	/1
5 August	13	/1
9 August	8	/1
12 August	0	/1
28 August	17	/1
4 September	1 - 15	10.5/6
6 September		
11 September	7 - 24	13.4/5
12 September	25±2	/1
13 September	12	/1
19 September	2	/1
24 September	21	/1
27 September	14	/1
30 September	4 - 24	11.2/9
	Cumulative average	11.5/44
11 October	7	/1
15 October	6	/1
22 October	1	/1
29 October	4	/1
30 October	5	/1
5 November	2	/1
11 November	0	/1
	Overall average	10.4/51

NOTE:
2 sighted at Lake Connewarre on 17 July and 21 August, 1980

Table 4 Sex ratios by sighting and location : 1978

THE SPIT	6 males :	5 females? :	1 imm ?
SWAN ISLAND	2 males :	1 female? :	1 imm ?
	1 male :	1 female? :	
	9 males :	6 females? :	
SWAN IS. TOTAL	12 males :	8 females? :	1 imm?
OVERALL TOTAL	18 males :	13 females? :	2 imm ?

Beak Colour

The beak colour probably changes from orange horn colour to grey/black about 5-6 months after hatching. This and wing bar characteristics have been noted in aviary bred Blue-winged and Elegant Parrots but to varying degrees (Joseph 1979; A. Isles pers. comm.; Lewitzka/Hutchings pers. comm.; Gokel, 1975).

Proposed Management of the Orange-bellied Parrot in Victoria

With any endangered species, it is a common practice to delineate critical habitats for an animal's various activities (Ripley & Lovejoy 1979).

Lane *et al* 1979 found the Parrot pecks about 10-12,000 times daily at Pt. Wilson in saltmarsh. Plant seeds here are minute with fleshy parts on the exterior that are apparently discarded.

Roosting off the ground by one or more 'sentry' birds, that observe for predators, etc., occurs at Pt. Wilson and Tasmania (Lane *et al* 1979 a, b).

It appears from our study that Saltmarsh Shrubland and adjacent Grassland of the *Arthrocnemum arbusculum* association is very critical preferred habitat for most activities of the Parrot in Victoria. The associated buffer of *Salicornia* Herbland, Sand Dune/Strandline and Woodland are also essential critical habitat.

In particular, the habitat near Pt. Wilson, adjacent to the proposed I.C.I. plant is a seemingly irreplaceable habitat for this species.

Over eighty per cent of the known population were seen at The Spit (F. Lobb, pers. comm.).

Critical Questions

The questions to answer regarding critical habitat ecology and behaviour still are:

i) Where does the Parrot roost in Victoria at night?
ii) Where do the Parrots breed and why are numbers of immature or yearling Parrots so low?

Concern should also be raised at the low number(s) of the Parrot seen and that the overall population appears to be about 100, (B.O.C. in Geelong Regional Commission 1978; R.A.O.U. in Geelong Regional Commission 1978; Dedman 1979; Green 1978; Loyn and Chandler 1978) but more detailed surveys are required before the total population number can be ascertained. Concern should also be expressed that possibly only three immatures were seen out of the about 92 Parrots observed in the I.C.I. study, (Loyn and Chandler 1978).

iii) Can we create more natural or other suitable coastal saltmarsh habitats, artificially feed and/or restock the wild population?
iv) Why is the Parrot so reliant on this particular habitat?

Table 5 Habitat types found at the Spit

TYPE/ASSOCIATION	TYPICAL SPECIES
Saltmarsh shrubland:	*Arthrocnemum, Suaeda, Salicornia Distichlis*
Sand dune and Strandline:	*Atriplex, Cakile, Melaleuca, Leptospermum*
Woodland/Grassland:	*E. viminalis, Casuarina stricta Acacia, Poa, Stipa sp.*

Figure 5. View of coastal study area.

In Victoria, there is a critical scarcity of habitat, there being only a few hundred hectares. In South Australia and Tasmania, it appears that there is some other limiting factor(s) associated with the low total population. Several year's work still needs to be done — similar to the situation with the Whooping Crane, Peregrine Falcon, and Californian Condor overseas (Ripley & Lovejoy 1979).

v) Most importantly, I.C.I. Australia must scientifically assess at Point Wilson all the potential effects of detrimental factors on the Parrot and other wildlife related to their establishing and maintaining the Petrochemical Plant.
Will this species adapt if I.C.I.'s development is expected to disrupt its prime wintering habitat?

Problems such as the following could arise:

1. Noise of the level that affects wildlife and habitat will be generated (United States Environment Protection Authority 1971).
2. Groundwater and drainage changes could significantly alter the critical salt-marsh habitat (I.C.I. Australia 1978, 1979).
3. Levels of lighting and airborne chemicals proposed could be intense enough to be adverse to the Parrot and other wildlife. Parrots have a sense of smell (Bang & Cobb 1968; Mykytowycz 1978).

Flames of off-shore drilling rigs in the northern North Sea have adversely affected and killed many birds (Sage 1979).

Proposed Answers

These critical questions could be answered by proposals to:

i) appropriately study and band some

aviary bred Orange-bellied Parrots, provided there are adequate numbers and that radio tracking studies of aviary bred Blue-wing Parrots are successful.

Leg banding of Orange-bellied Parrots and Blue-winged Parrots has been carried out in South Australia in the past and would probably require stainless steel bands (D. Purchase, pers. comm.).

ii) search for the Parrot at all known past sighting localities simultaneously, provided the three State and Federal government bodies, several naturalist groups and private commercial interests can co-operate effectively.

iii) assess the impact of the proposed plant at Pt. Wilson on the Parrot. I.C.I. Australia has indicated in various reports, newspapers, and newsletters (I.C.I. Australia 1978; Australian Conservation Foundation 1978, 1979) that it will undertake essential and extensive impact studies but appears not to have done so (G. Wischer, B. Jenkins, pers. comm., 1979).

This type of impact study has been carried out to assess the impact of a proposed Viewing Tower on a large Ibis colony near Kerang in Victoria, (C. Anderson, R. Weber, unpub. data 1977, 1978), overseas with a Power Plant, (Andrews and Anderson 1978), with Chemicals, (Ellison and Clearly 1978), in Australian Airports, (Van Tets *et al* 1977) and the Alaskan Arctic Pipeline, (McCourt *et al* 1974; Lenazy 1974; Gollop *et al* 1974; Salter and Davis 1974).

Lanscaping and other devices cannot stop the effects of noise, lights and high towers (Sage 1979).

I.C.I. Australia will hopefully prove that the proposed plant will not contribute to the extinction of this rarest species. If it appears that the Parrot will not adapt, the onus is on I.C.I. Australia to devise and test, in conjunction with the appropriate parties, plans that will ensure the continuation of this species.

iv) When the World Wildlife Fund study of the Parrot begins in 1979, answers to these important questions to the Parrot's survival must be provided.

The future of one of the I.U.C.N.'s (International Union for Conservation/Nature) and the I.C.B.P.'s (International Council for Bird Preservation) rarest parrots in the world is thus still very uncertain.

Australian people will not have much to say for themselves if they stand by and let a species as rare as the Whooping Crane become extinct.

Summary

The Orange-bellied Parrot (*Neophema chrysogaster*) was surveyed by volunteer naturalist observers, co-ordinated by the Fisheries and Wildlife Division, Victoria, to assess the Parrot's habitat and behaviour inter-relationships.

The survey found the Parrot during 1978 in only two of six coastal survey locations. The total numbers of the Parrot seen were 25 individuals at the Spit (near Pt. Wilson) and 17 individuals at Swan Island.

The Parrot was seen feeding in about a half of all sightings, mainly on Shrubby Glasswort (*Arthrocnemum arbusculum*) in 1978. The Parrots fed in grassland in about two-thirds of all sightings in 1979.

Salt Marsh shrubland and contiguous coastal native or introduced grassland habitat are considered critical for feeding and other behaviour of the Parrot, and for the survival of this species in its wintering grounds in Victoria.

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Deletion of Victorian Vascular Plants and Their Grid Distribution

BY A.C. BEAUGLEHOLE †

Introduction

Since the publication of "A Handbook to Plants in Victoria" by J. H. Willis (1970 & 1972) and "The Distribution of Victorian Plants" by Churchill & de Corona (1972), the present author, with the help of others, has been compiling a list of species which have been deleted from the Victorian flora for various reasons e.g. now considered to be hybrids, or no longer recognized as distinct at species level; no records of spontaneous occurrence in Victoria etc.

The author (1978, 1979 & 1980) has already published many of these, but at that time Major Grids were not specified. They are specified here as this affects the species totals for the Major Grids involved.

In order to gain an appreciation of such discrepancies the author felt it is necessary to publish such information for the benefit of other workers. Criticisms, comments and suggestions to assist in further up-dating would be welcomed.

Acknowledgement

I wish to thank all those persons who have helped with up-dating of our Victorian flora (persons too numerous to mention individually).

Deletion of Victorian vascular plants and their grid distribution

The following list is based on the alphabetical arrangement of Churchill & de Corona (1972).

† 3 Beverley Street, Portland, 3305.

Symbols preceding names:

F Form (Species in brackets)
H Hybrid (Parents in brackets)
N Not recognized for Victoria
V Variety or subspecies (Species in brackets)
* Species introduced to Victoria

NOTE: GRIDS with CAPITAL LETTERS indicate that these affect assessment of Grid species totals i.e. the same Grid was recorded for both species and variety etc. (207 Grids are affected). Grids with small letters do not affect grid species totals i.e. such grids were only recorded once for such species. Grids follow name of plant.

H *Acacia grayana (A. brachybotrya x A. calamifolia)* C
V *Acacia paucijuga (A. deanei)* hlm Rvw
H **Agropogon littoralis (*Polypogon monspeliensis x *Agrostis stolonifera)* N
F *Aphanes pentamera (A. australiana)* C
F *Asplenium adiantoides (A. falcatum)* d e
N *Atriplex inflata* AFGM
N *Atriplex muelleri* AGP
H *Caladenia tutelata (Glossodia major x Caladenia deformis)* D
F *Caleana sullivanii (Paracaleana minor)* CDJ
V *Callitris verrucosa (C. preissii)* ABC
F *Calochilus saprophyticus (C. campestris)* EpV
H *Chiloglottis pescottiana (C. trapeziformis x C. gunnii)* V
H *Cyathea marcescens (C. australis x C. cunninghamii)* KTZ
F *Daviesia virgata (D. mimosoides)* dhjmnprStVWZ
F *Diuris brevissima (D. maculata)* DHJMNS
H *Diuris palachila (D. maculata x D. pedunculata)* DHJMNRT
N *Epilobium tasmanicum* SV
V *Eucalyptus cephalocarpa (E. cinerea)* NRSW
V *Eucalyptus maidenii (E. globulus)* twz
V *Eucalyptus stjohnii (E. globulus)* jKnPrT
N *Eucalyptus stricta* S
N **Ficus carica* Z
N **Fumaria officinalis* CMN
?H *Grevillea williamsonii (?)* D
F *Haloragis depressa (Gonocarpus micranthus)* VZ
N *Haloragis glauca (Gonocarpus glauca)* CGR
F *Haloragis rubra (Gonocarpus tetragynus)* CN
F **Juncus acutiflorus (?)* EJKNQRSVW
V *Juncus fockei (J. holoschoenus)* CDJMNVWZ
N **Kickxia commutata* J
N *Kochia villosa (Maireana villosa)* abcfghmn (records belong to M. decalvans)
V *Lepidium dubium (L. aschersonii)* JK
F *Leptospermum grandifolium (L. lanigerum)* JNRSTVWZ
N **Lupinus hirsutus* BH
N *Luzula campestris* cdehjkmnprstuvwxz
N *Mecodium dilatatum (Hymenophyllum dilatatum)* S
F *Microtis biloba (M. unifolia)* CDNTV
F *Microtis bipulvinaris (M. parviflora)* CDEJP
F *Microtis holmesii (M. parviflora)* T
N *Olearia stellulata* E
N **Oxalis tetraphylla* W
F *Patersonia longifolia (P. sericea)* Z
H *Persoonia lucida (P. levis x P. linearis)* Z
V *Phebalium ovatifolium (P. squameum)* sw
V *Phebalium ozothamnoides (P. squamulosum)* vWZ
F *Pimelea collina (P. linifolia)* DEJMNRSTW
F *Pimelea micrantha (P. curviflora)* Cg
N *Potamogeton cheesemanii* CD
N *Potamogeton lucens* W
F *Potamogeton sulcatus (P. tricarinatus)* a CgNRUVW
F *Prasophyllum colemaniae (P. odoratum)* N
F *Prasophyllum gracile & P. frenchii (P. fuscum)* bCDEHJJ (note J twice) kmNPrs
F *Prasophyllum odoratum (P. patens)* bcDEhJkMNPrSTvwZ
N *Pterostylis acuminata* NRSVW
F *Pterostylis celans (P. nana)* E
F *Pterostylis crypta (P. obtusa)* T
H *Pterostylis toveyana (P. alata x P. concinna)* DJNP
N **Rubus scabripes* EK
H *Senecio orarius (S. lautus x S. sp.)* PTZ
N *Solanum eremophilum* H
N **Solidago canadensis* KTW
N *Stylidium despectum* CDEHJMNPRZ
N *Stylidium lineare* VW
HorF *Thelymitra cyanea (T. renosa ?x)* Z
H *Thelymitra irregularis (T. ixioides x T. carnea)* ENTZ
F *Thelymitra murdochae (T. aristata)* T
F *Thelymitra nuda (T. longifolia)* CDP
V *Thelymitra rubra (T. carnea)* DeJKMNpSTvWZ
F *Tieghemopanax multifidus (Polyscias sambucifolia)* WZ

H *Trymalium ramosissimum (T. daltonii x Spyridium parvifolium)* DJ

F **Vicia angustifolia (*V. sativa)* AkNPSTw

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The Flora and Avifauna of Dannevig, Norman and Wattle Islands, Wilsons Promontory, Victoria

BY F. I. NORMAN , R. S. BROWN AND D. M. DEERSON †

Introduction

Gillham (1960, 1961, 1962) reported on aspects of the vegetation of eight Promontory islands. Since her visits the floristics of another island, Cliffy, have been discussed (Hope and Thomson 1971) and more recent observations on Rabbit and Citadel Islands have been presented (Norman 1967, 1970; Norman and Brown 1979, Norman and Harris 1980). As no botanical details have been provided previously for Norman and Wattle Islands, and Dannevig was last investigated in 1959, we present information collected on 12 December 1979 (Wattle) and 17 January 1980 (Norman and Dannevig). Observations on the avifauna are also summarised. Some climatic details for the Promontory lighthouse have been provided elsewhere (Hope and Thomson 1971).

Dannevig Island (within the Glennie Group of islands) lies about 360 m to the south of Great Glennie, some 9.8 km south-west of Tidal River on the Promontory mainland. The 19.6 -ha island is about 960 m long, 390 m wide at the widest point and reaches 76.5 m at the summit on the southern end. It is generally narrow and steep-sided, rises to a central ridge above the western and eastern coasts, and has a flatter area above the south-eastern end. Soil development is restricted, being most extensive above and around the south and south-eastern coast. Elsewhere massive outcrops of rock dominate the surface, and in some areas bare rocks slope, often directly, into the sea.

As with all Promontory islands, Norman Island is of coarse-grained granite. The island rises to domed peaks at the northern and southern ends, and has a flat and low central shoulder. The highest point (96 m) is on the northern end. The island is about 1400 m long, 660 m wide across the northern end and occupies about 48.0 ha. Most of the island's eastern slopes, which are less steep than those elsewhere, are well-covered with soil exceeding 0.4 m in places. However, outcrops of rock occur extensively on the island and soil is present only near the summit on the exposed western slopes. The shoreline is primarily of granite blocks and boulders; sheer faces enter the sea on the southern and north-western ends. The western shore of the shoulder extends seawards as granite boulders, but on some sections of the eastern coast low cliffs occur above wave platforms.

Wattle Island is about 0.5 km south of Wilsons Promontory, and 5 km west-south-west of the lighthouse. The island is narrow, about 350 m at the widest

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point and runs, generally east-west, for about 1030m. Wattle Island, some 21.7 ha in area, rises to a central spine which reaches 82 m towards the western end. Derived soils, organically rich as on other islands, contain large quartz crystals. Generally the island's northern slopes are well-vegetated, but the exposed, southern side of the island is often sheer and supports less vegetation. Around most of the island, but particularly on the southern coast, the bedrock drops into the sea as boulders or as rounded or faulted sheets.

Methods

The major plant communities (defined by the dominant species) were identified and their approximate distribution was plotted onto aerial photographs of each island. Plant specimens were collected, breeding localities for some seabird species were identified and miscellaneous observations on other bird species were made as the islands were traversed. Areal measures derived from the photographs, and used below, are approximate only and would be modified considerably by the topographic variations.

Results

Flora

A listing of the vascular plants found on each island is given in Table 1.

DANNEVIG ISLAND

In 1959 Gillham recorded 20 vascular species from Dannevig, 19 of them native species; we found a further 5 species in 1980. The major plant community was a *Poa poiformis* tussock grassland which was restricted mainly to the eastern side and to the flatter area above the south coast, where the community was more uniform, and contained few rock outcrops. Included in this community were occasional *Bulbine bulbosa, Correa alba* and *Alyxia buxifolia; Apium prostratum* was found in sheltered crevices, and *Tetragonia implexicoma* was infrequent in otherwise bare areas between boulders.

Disphyma australe formed a disjunct community up the western slopes towards the summit, though on the eastern side the community was lower and more restricted. Mats of *Salicornia quinqueflora* were also present along the summit on the northern end.

Vegetation covers only about 7 ha (c. 36%) of the island's planar surface, and bare rock dominates the island's topography.

NORMAN ISLAND

We found 27 vascular species on the island in January 1980, though the dry summer may have reduced the number of species available (particularly grasses). *P. poiformis* tussock grassland formed the island's major community (Figure 1), occupying some 20.8 ha (c. 43% of the surface). In general the community was fairly uniform and dense but was more open on the west; elsewhere the community contained small bare areas previously dominated by *Senecio lautus* (which had died back). Associated with the *Poa* were *Bulbine bulbosa, Pelargonium australe,* and *Helichrysum* spp. Soil accretion was influenced by exposure and by the slope of underlying bedrock but soil depths often exceeded 0.4m. On the northern face of the southern peak, and scattered on the northern end, were small areas dominated by a mixed shrub community. Generally *Alyxia buxifolia* was the most abundant species, but other species, *Acacia ?stricta, Leucopogon parviflorus, Melaleuca ericifolia* and *Leptospermum laevigatum* were variously dominant and *Correa alba, Apium prostratum, Helichrysum* sp. and *Rhagodia baccata* were often associated with them. Occasionally *Tetragonia implexicoma* trailed in and around the dense stands of bushes, particularly on the eastern slopes, but small stands on the more exposed areas tended to be confined to crevices, or areas sheltered by large outcrops of rock.

Disphyma australe dominated the other major community on Norman Island. Usually this prostrate species was established in rock crevices from which it extended over rock surfaces.

Table 1. Species lists for Dannevig, Norman and Wattle Islands; Dannevig details for 1959 from Gillham (1961).

	DANNEVIG 1959	DANNEVIG 1980	NORMAN	WATTLE
Asplenium obtusatum		+	+	+
Scirpus nodosus			+	
Juncus maritimus			+	
Bulbine bulbosa		+	+	+
semibarbata	+			
Phragmites sp.			+	
Poa poiformis	+	+	+	+
Stipa teretifolia	+			
Carpobrotus rossii	+	+	+	+
Disphyma australe	+	+	+	+
Tetragonia implexicoma	+	+	+	+
Apium insulare				+
?prostratum	+	+	+	
Alyxia buxifolia	+	+	+	+
Brachycome diversifolia	+	+	+	
Helichrysum apiculatum			+	
bracteatum	+	+	+	+
**Hypochoeris* sp.			+	
Olearia phlogopappa				+
Senecio lautus	+	+	+	+
**Sonchus oleraceus*	+	+		+
Sambucus gaudichaudiana			+	+
Stellaria multiflora				+
Casuarina stricta				+
**Chenopodium album*		sp.		+
Rhagodia baccata	+	+	+	+
Salicornia australis	+			
quinqueflora		+		
Crassula macrantha		+	sp.	
sieberana	+			
Lepidium praetervisum				+
Leucopogon parviflorus			+	
Pelargonium australe	+	+	+	+
Lobelia alata	+		(Fam.)	+
Lavatera plebeia	+			+
Acacia ?stricta			+	
**Albizia lophantha*				+
Kunzea ambigua			+	
Leptospermum laevigatum			+	+
Melaleuca ericifolia			+	
Muehlenbeckia adpressa				+
Calandrinia calyptrata	+			+
Correa alba	+	+	+	+
Solanum aviculare				+

Cover was usually moderate, and apparently was related to exposure. Thus the community occurred high above the splash zone on the western coast, but on the western shore of the shoulder the species formed a dense low sward which was evidently well-grazed, and manured, by Cape Barren Geese. Included within the community were occasional small stands of *P. poiformis, Tetragonia implexicoma, Carpobrotus rossii* and *Apium prostratum*. The last species was more abundant in sheltered areas.

A small stand of *Phragmites* sp. was present on the sheltered, eastern coast under the low cliff and was supported by a presumably permanent seepage.

WATTLE ISLAND

Three communities were identified on Wattle Island; their distribution is shown in Figure 2. As on the other islands *Poa poiformis* tussock grassland provided most of the island's vegetation cover (c. 9.6 ha, 45% of the island's area). However, unlike most of the other Promontory islands, the growth form of the *Poa* on Dannevig and Wattle Islands was dense, compact, short and matted (see also Gillham 1961). This community was usually uniform throughout its extent, but did include small stands of *Senecio lautus*,

Disphyma australe and isolated *Solanum aviculare* and *Helichrysum bracteatum*. There was no well-developed supra-littoral community and *Poa* grew down towards the splash zone, particularly on the western slopes. Soil depth within the community varied but in several areas on the northern side it exceeded 0.5 m, deeper than that found under the *Disphyma* community. The *Disphyma australe* herbfield was confined to a small area (c. 1.1 ha) on the south-eastern side of the island, and to isolated areas some 10-30 m above the northern splash zone. Cover was generally complete where the species was established in soil but occasional stands were rooted in crevices and extended over rocks. Except for individual *P. poiformis* tussocks and *Bulbine bulbosa* on the higher reaches the community included few species.

A mixed scrub community dominated usually by *Leptospermum laevigatum* was a feature of the island's spine. This community, which often was 2-3 m high, included *Correa alba, Albizia lophantha* and, particularly on the western end, occasional *Alyxia buxifolia*. Associated with this

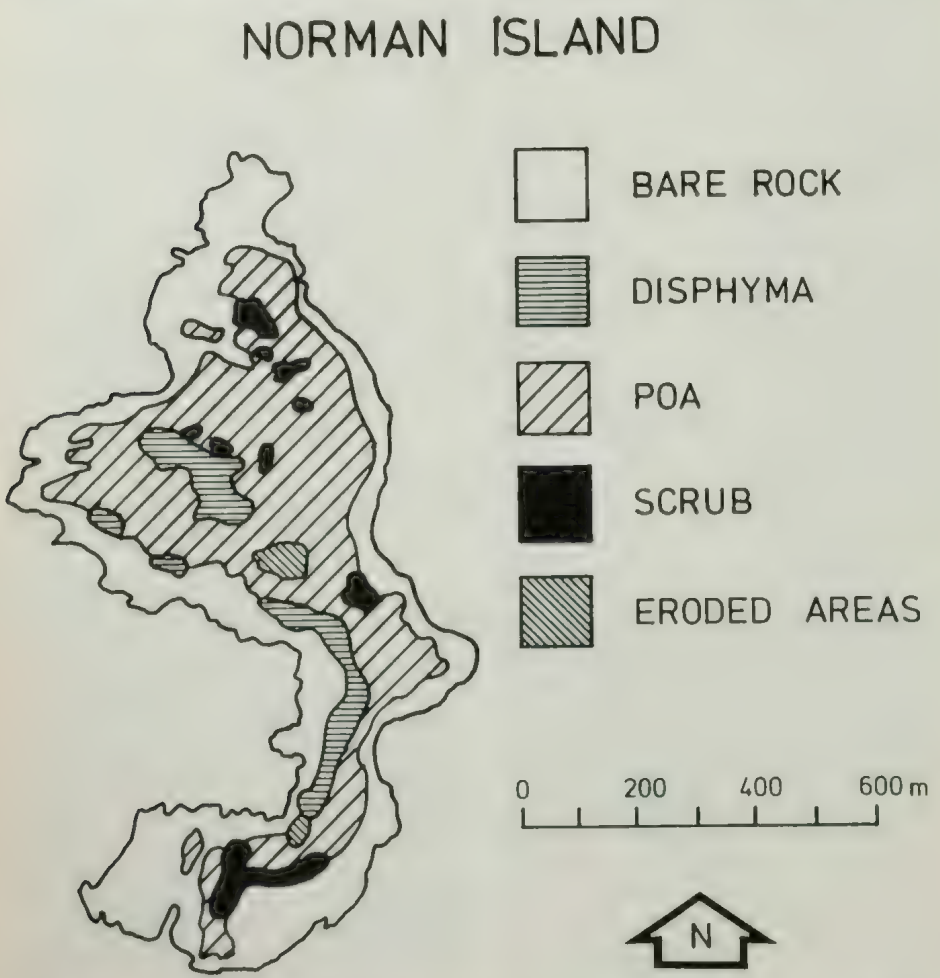

Figure 1. Approximate distribution of major plant communities on Norman Island, January 1980.

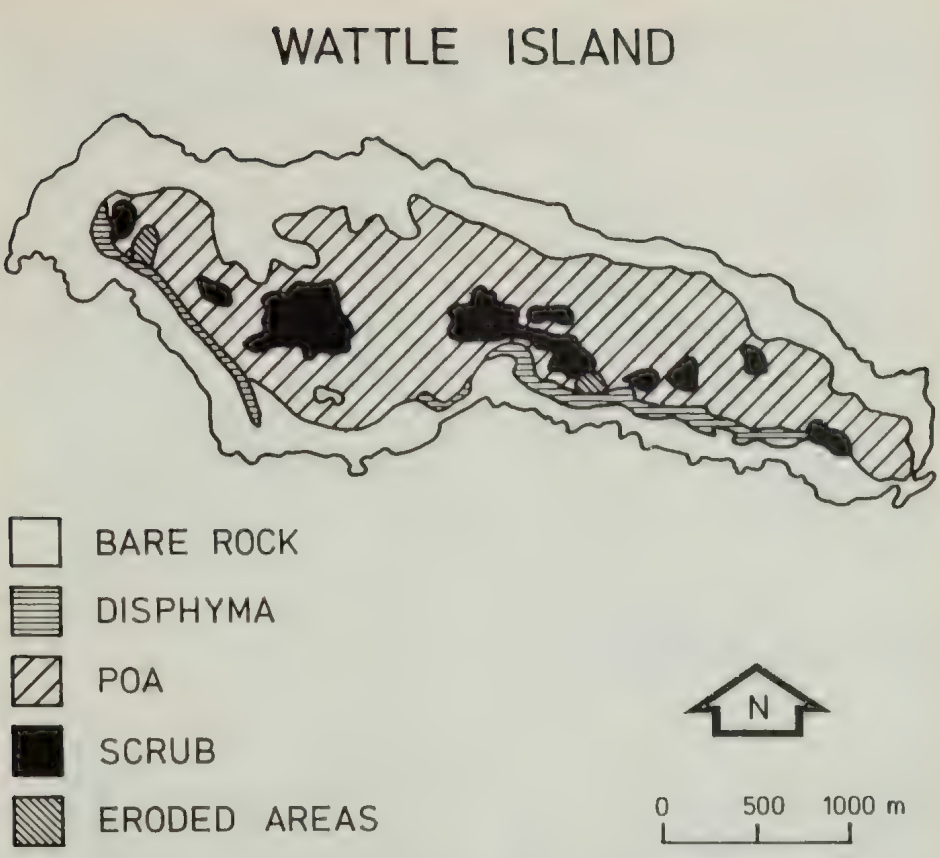

Figure 2. Approximate distribution of major plant communities on Wattle Island, December 1979.

community, although not exclusively, were luxuriant forms of *Apium prostratum, Olearia phlogopappa* and *Pelargonium australe.* On the western end of the island a few small clumps of *Casuarina stricta* grew amongst a denser stand of *Leptospermum.* Shrub species were found as small stands over much of the island but they were less frequent on the southern slopes. Old stumps and branches scattered about the island provided evidence of a previously more extensive distribution.

Birds

There is little information on the islands' avifauna. A.H. Mattingley provided some details for an article on Victorian islands (Commonwealth of Australia 1912), which listed Cape Barren Geese and Hooded Dotterels on Norman Island, and penguins, muttonbirds and oystercatchers on both Norman and Wattle Islands. Lane (1979, *pers. comm.*) has provided notes on birds of the three islands; Gillham (1961, 1962) discussed some of the seabirds on Dannevig Island and Dorward (1967) recorded Cape Barren Geese on all three islands. These records, and our observations, may be summarised as follows:—

***Eudyptula minor* Little Penguin**

Gillham (1961) noted, as did Lane (1979), that penguins bred on Dannevig. Whilst no attempt was made to estimate numbers during our visit, few burrows were found and most nests were under rocks on the south-eastern coast. The topography of the island, and the exposure of the western side, could limit

Table 2. Species: area ratios for some Promontory islands compared with details from the Hogan Group. The Victorian islands are ranked in order of increasing exposure as estimated by Gillham (1961).

	TOTAL			SPECIES: AREA RATIOS	
	Species	Native species	Area (ha)	All species	Native species
Hogan Group					
Long[1]	54	41	18.2	1:0.3	1:0.4
East[1]	8	7	10.1	1:1.3	1:1.4
Hogan[1]	145	87	131.6	1:0.9	1:1.5
Corner Inlet					
Doughboy[2]	107	85	3.2	1:0.03	1:0.04
Benison[2]	66	55	5.0	1:0.08	1:0.09
Promontory Islands					
Granite[2]	22	15	1.05	1:0.05	1:0.7
Rabbit[3]	63	49	30	1:0.5	1:0.6
Cliffy[4]	41	23	7.7	1:0.2	1:0.3
McHugh[2]	18	18	9.2	1:0.5	1:0.5
Dannevig[5]	25	23	19.6	1:0.8	1:0.8
Citadel[6]	25	21	18.8	1:0.8	1:0.9
Wattle	27	24	21.4	1:0.8	1:0.9
Norman	27	26	48	1:1.8	1:1.8

1. From Scarlett, Hope and Calder (1974).
2. From Gillham (1961) and unpublished data.
3. From Norman (1970) and unpublished data.
4. From Hope and Thomson (1971).
5. From Gillham (1961) and this survey.
6. From Gillham (1961) and Norman and Brown (1979).

numbers.

On Norman Island burrows were relatively few, and nest sites were again mainly under rocks. Only a few penguin tracks were noted on the eastern side, and Lane's estimate of 400-500 breeding pairs (in 1979) seems appropriate. Lane (*pers. comm.*) found 150-200 burrows in a small area of Wattle Island, and we found burrows scattered over the whole island, but more concentrated along the northern edge. Burrows or nest sites may number about 1000, a large proportion of which are under rocks and in crevices.

***Pachyptila turtur* Fairy Prion**

The corpses of several Fairy Prions were found on Wattle Island, occasionally near Pacific Gull nests, but neither Lane (*pers. comm.*) nor we found any evidence of nesting. Lane (1979) found breeding birds on Dannevig and we found a few dead birds on the western side. We also found dead prions on Norman Island (also near Pacific Gull nests) though no nest burrows were definitely identified.

***Puffinus tenuirostris* Short-tailed Shearwater**

On Dannevig Island we found shearwater burrows only under *Poa*, and mostly on the southern end. The mean density of burrows in 15 circular quadrats of 20 m^2 was 0.7/m^2 and extrapolation for the 6.5 ha of burrowed tussock suggests that the total number of burrows was 44,600 ± S.E. 3400, far in excess of Gillham's (1961) total of 2,000-3,000. Extrapolation of mean burrow density (0.7 burrows/m^2) with area burrowed on Norman Island gave a total of 145,000 ± 6825. On Wattle Island shearwaters nested throughout the island, mostly under *Poa*, wherever the depth of soil allowed. Average burrow density in 30 circular quadrats of 20 m^2 was 0.81/m^2 and the estimated number of burrows was 77,750 ± 2875 in the *Poa* and a further 5700 ± 1525 in the *Disphyma*, where burrow density in five 20m^2 quadrats was 0.5/m^2. On this island, as on Norman or Dannevig, the steepness of the island's slopes would markedly increase the surface area and therefore the burrow estimate must be considered minimal.

***Pelecanoides urinatrix* Common Diving-Petrel**

Lane (*pers. comm.*) found dead petrels on Wattle Island, and recorded them nesting on Norman and Dannevig Islands. We identified only three burrows on the eastern coast of Norman Island but Gillham (1961) found several hundred burrows, apparently of this species, on Dannevig Island.

***Ardea novaehollandiae* White-faced Heron**

We saw one bird on Norman Island.

***Leucocarbo fuscescens* Black-faced Shag**

In November 1979 Lane (1980) recorded about 30 birds nesting on the eastern side of Dannevig, and young birds were still present in January 1980. Gillham (1961) did not record breeding on the island in 1959. We found no evidence of recent nesting on Norman and Wattle Islands (though 15 and 80+ birds, respectively, were roosting there), nor did Lane find nests on his earlier visits.

***Cereopsis novaehollandiae* Cape Barren Goose**

Dorward and Pizzey (1965) reported three or four pairs of geese on Wattle in 1964, and we saw a similar number. Lane (*pers. comm.*) considered that there were some 70 geese on Norman Island, where he banded non-flying young but our counts were less (eight birds including flying young). On Dannevig, where Gillham (1961) recorded breeding, we saw five Cape Barren Geese though the species was not listed by Lane (1979). Dorward (1967) recorded three pairs on Dannevig and five on Norman Islands.

***Haliaeetus leucogaster* White-bellied Sea Eagle.**

A nest of this species was found on Wattle Island (containing leaves of *Banksia integrifolia* and *Eucalyptus baxteri*, species not recorded there). An adult and flying young were disturbed from the site as we landed.

***Circus aeruginosus* Marsh Harrier**

Recorded on Norman Island by Lane (*pers. comm.*) and by us.

***Falco peregrinus* Peregrine Falcon**

One bird seen on Wattle Island.

***Falco berigora* Brown Falcon**

One bird seen on Wattle Island.

***Falco cenchroides* Australian Kestrel**

Only recorded on Norman Island, during Lane's (1979) visit and ours.

***Rallus philippensis* Buff-banded Rail**

We found a nest with six eggs in *Poa* tussock on the southern slopes of Wattle Island.

***Haematopus fuliginosus* Sooty Oystercatcher**

Wattle Island held about six pairs, and two nests were found there; we estimated at least four pairs on Dannevig Island and six on Norman Island, where Lane (*pers. comm.*) also found two nests.

***Larus novaehollandiae* Silver Gull**

Breeding was not recorded on Wattle Island in November 1979 (Lane, *pers. comm.*), but we found 68 nests, mainly with eggs, on the northern coast. There were two colonies on Norman Island, of about 35 and 50 pairs, and at least 10 nests on Dannevig. Lane (*pers. comm.*) found breeding birds on both islands in November 1979 and about 12 nests on Dannevig in 1978 (Lane 1979).

***Larus pacificus* Pacific Gull**

Lane found a nest on Dannevig in November 1979, and we considered that more than 20 pairs were still breeding in January 1980. At least 35 pairs were present on Norman Island, though Lane had estimated 120 birds, including nesting pairs, in November 1979. Lane recorded nesting on Wattle and we estimated about 30 pairs still breeding in December 1979.

***Sterna bergii* Crested Tern**

Four birds were present on Norman Island, but we found no nests.

***Hirundo neoxena* Welcome Swallow**

Recorded by Lane in November 1979 on Wattle Island, and we saw birds there and on Norman Island.

***Turdus merula* Blackbird**

Blackbirds were seen on Wattle Island (6-8 birds), on Norman (3) and on Dannevig (1) Islands. Lane recorded them on all islands during his earlier visits.

***Sericornis frontalis* White-browed Scrubwren**

At least 10 birds were recorded on Wattle Island.

***Zosterops lateralis* Silvereye**

Two were present on Wattle Island, and others were flying across to the Promontory.

***Corvus tasmanicus* Forest Raven**

Recorded on Norman and Wattle Islands.

Discussion

Poa poiformis tussock grassland, which usually supported large colonies of shearwaters, formed a major community on each of the three islands discussed here, as indeed it often does throughout the Bass Strait islands (e.g. Gillham 1961, 1962; Norman 1970). The succulent *Disphyma australe* also formed extensive communities but the distribution of communities of mixed shrubs is restricted on the islands (though on Wattle Island there was evidence of a wider coverage previously). Gillham (1961) suggested that the number of plant species per unit area on the Promontory islands decreases with increasing exposure; this correlation is improved if only native species are considered (Hope and Thomson 1971). Whilst it is apparent (Table 2) that the sheltered Corner Inlet islands have more native, and total, species per hectare, most of the other Promontory islands have ratios within the range 1:0.6-0.8 (all species) and 1:0.5-0.9 (native species). However, Norman Island appears more impoverished, and Cliffy Island more enriched, than the other islands. The dry summer may well have reduced species available on Norman when we visited it, whilst Cliffy Island has a high alien content (Hope and Thomson 1971). The reconstructed ratios given in Table 2 (which include island areas recalculated from recent aerial photographs, and an increased number of species compared with that available to Gillham (1961)) do not show a clear series of increased number of species : area with decreased exposure *sensu* Gillham, and some previous anomalies which she showed have now disappeared. An increase in the number of plant species on Rabbit and Citadel Islands may be associated with the extinction of rabbits on the two islands (Norman and Brown 1979, Norman and Harris 1980) but Gillham's collections were made when drought was affecting islands and her species totals were presumably incomplete (Gillham 1961). Additionally, the use of planar areas as distinct from actual surface areas discounts the range of topographic variation, and hence growth opportunities.

Hogan and Cliffy Islands have a larger proportion of alien species than do other islands considered here (Table 2), possibly a consequence of earlier human activity (Scarlett, Hope and Calder 1974; Hope and Thomson 1971). Whilst the influence of rabbits has been to reduce the number of species and to encourage aliens (Gillham 1961, Norman 1970), the varying human utilisation of Bass Strait islands has undoubtedly played a major role in their floristics. Stocking of some islands, and associated introduction of selected species, together with burning and deliberate removal of scrub and grazing, would all assist in the reduction and degradation of the native communities. Some visitors to the Promontory islands may have reduced scrub (by fire, or deliberate cutting as on Citadel), and could also have assisted in the spread of alien species. That Rabbit Island was frequently visited, and was occupied for a period, has been discussed elsewhere (Lennon 1974, 1975); Citadel and Doughboy Islands were also inhabited for periods (Gillham 1960, Norman and Brown 1979). In contrast, that few alien species have been recorded on Norman (1), Dannevig (2), Wattle (3) Islands, and none on McHugh, may suggest that these islands have not been subjected to detrimental human activities.

If, as suggested elsewhere (Norman

1970), Promontory islands had a central shrub-dominated flora with coastal *Poa poiformis* tussock grassland, then removal of the scrub would influence the bird species using the islands. Other reports on the avifauna of islands off Wilsons Promontory (Abbott 1973, Norman and Brown 1979, Norman and Harris 1980, Wainer and Dann 1979) have indicated a paucity of passerine species. This note confirms the generalisation for a further three islands. Whilst Dannevig, Norman and Wattle Islands each hold large numbers of a few species of breeding seabirds, passerine species are few and breeding records absent (although the scrubwren, on Wattle Island, and the blackbird, on all islands, may be presumed to breed). The simple structure of the islands' existing major plant communities allows little scope for permanent utilisation by passerines, and those which have been recorded are probably transitory. Doubtless extended observation would add other birds to the species lists, including trans-Bass Strait migrants, but if, as Abbott (1973) suggested, the passerine fauna became extinct on islands such as these, the various human activities may have contributed to such declines.

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Observations on the Vulnerability of Two Species of Wattled Bats (*Chalinolobus*) to Diurnal Avian Predators.

By R. A. Young†

Introduction

Insectivorous bats are preyed upon by a large number of predators. In their review of bat mortality, Gillette and Kimbrough (1970) list 69 vertebrate and 5 invertebrate predators of bats. With the exception of the bat hawk, *Macheiramphus alcinus*, which subsists primarily on a diet of bats, most other vertebrates are opportunistic predators of bats (Black, et. al., 1979). Some predators occasionally inflict high mortality on bats that select roosts accessible to predators or that commence foraging flights during the twilight period (Allen, 1939). This paper reports differences in vulnerability of Gould's wattled bats (*Chalinolobus gouldii*) and chocolate wattled bats (*Chalinolobus morio*) to diurnal avian predators at two roosting sites in south-eastern Queensland.

Study Sites and Methods

Evening emergence of *C. morio* was observed 28 times between 1971 and 1975 at a roost located in the Bunya Mountains (elevation 1050m), 150 km NW of Brisbane. The bats occupied the attic of a building adjacent to subtropical rainforest. The roost serves as a maternity site and was occupied by bats in all months, except June to mid-August. Gould's wattled bats (*C. gouldii*) were observed 14 times between February and October 1975, in the city of Toowoomba (elevation 575m), 110 km W of Brisbane. This colony occupied the attic of a building in a 8 ha residential park. The attic was used as a maternity site during the summer of 1973-74 (H. Benecke, pers. comm.). Lactating females and non-fledgling juveniles were present when I first entered the attic on 18 February 1975.

Population size was estimated by counting bats as they emerged in the evening or by counting individuals within the roost. Time of emergence of the first bats was recorded. Bats collected in the roosts were weighed (±0.1g), aged (juveniles or adults), examined for injuries and reproductive condition, and banded prior to release. Pregnancy was assessed by abdominal palpation. Injuries were classified as minor or major based upon size, location and healing status of wounds.

Results

No predation of *C. morio* was recorded during 28 observations conducted at the time of evening emergence. Potential diurnal predators commonly observed near the roost were pied currawongs (*Strepera graculina*), Australian magpies (*Gymnorhina tibicen*), laughing kookaburras (*Dacelo gigas*), and occasionally pied butcherbirds (*Cracticus nigrogularis*) and grey butcherbirds (*Cracticus torguatus*).

During 14 evenings of observation at the roost of *C. gouldii*, diurnal birds were observed capturing or attempting to capture bats on three occasions. On 15 September 1975 at 6.00 p.m. (EST), a pied butcherbird (*Cracticus nigrogularis*) intercepted and captured a bat as it flew from the attic. The bat was approximately 0.2 m from the attic when captured. The butcherbird carried its prey to a tree located approximately 200m from the roost and was not observed again that evening. During the next observation periods (12 and 13 October 1975), three bats were captured in flight and four unsuccessful attacks by pied butcherbirds were observed. All captures or attempted captures were made with the birds beak. The unsuccessful attacks on flying bats occurred about 100m from the roost; these bats suddenly altered their flight

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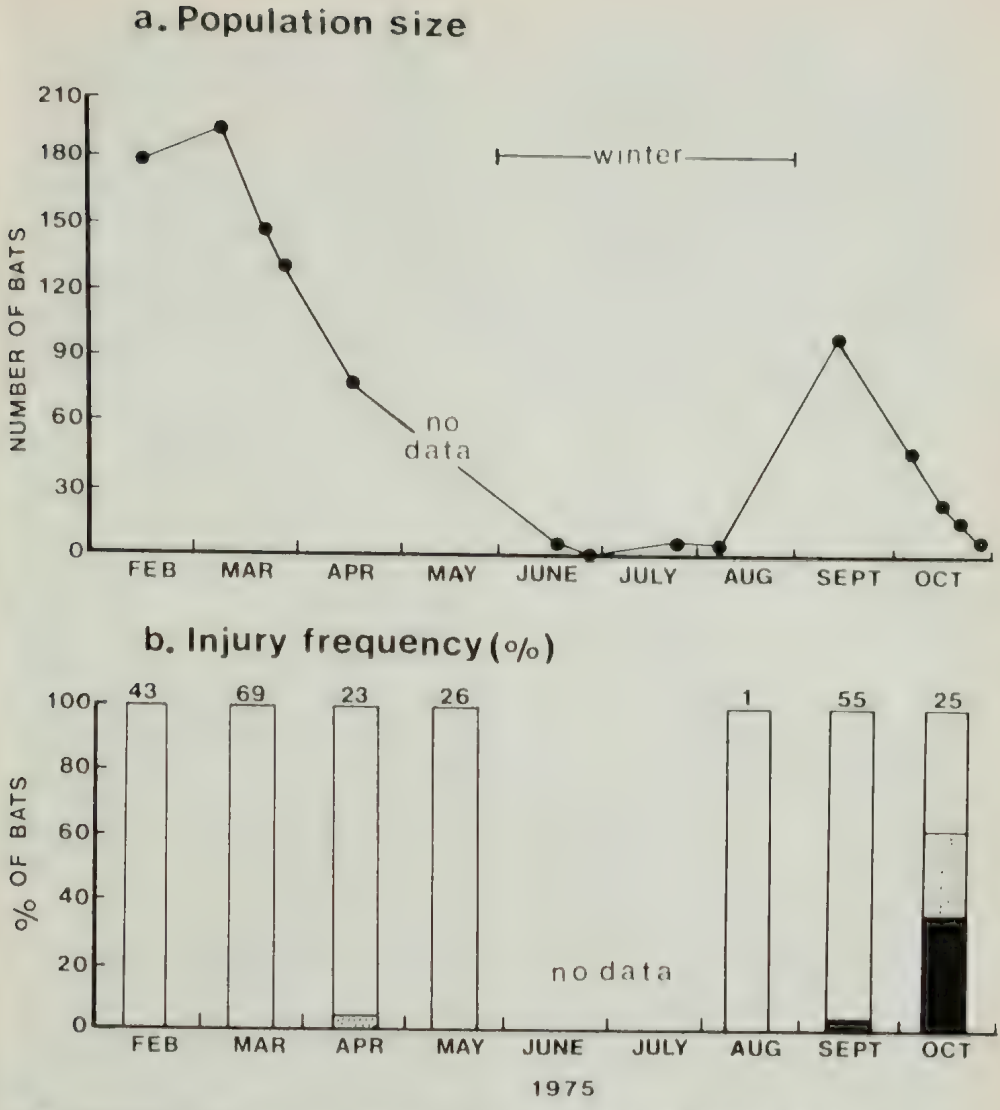

Fig. 1. Population size (a) and injury frequency (b) for *Chalinolobus gouldii*. Open bars represent no visible injuries; stippled areas represent minor injuries and black areas represent major injuries. Sample sizes are given above each bar.

pattern, in a manner suggestive of avoidance behaviour, just prior to interception. Only a single butcherbird was present at any one time during these observations. Pied butcherbirds are relatively common in Toowoomba and nest during September and October. Pied currawongs pursued bats on two occasions, but no captures were observed.

On 12 and 13 October, about 50% of the *C. gouldii* observed leaving the roost displayed abnormal flight. These bats "flopped" down the roof and became airborne after falling from the edge of the roof. The resulting flight path was often within 1.5m of ground level. Several bats flew erratically close to ground level until gaining sufficient altitude to land in a nearby tree, whereas

others laboriously attempted to re-enter the attic. One weakly flying adult female which landed on the ground had a portion of the liver protruding from an abdominal wound and a badly torn wing membrane. All three bats captured by pied butcherbirds displayed this weak flight.

Awkward flight is often exhibited by young bats and females in advanced pregnancy. The weak flight of *C. gouldii* observed on 12 and 13 October was apparently due to injuries inflicted by predators, because no juveniles or females in late pregnancy were observed in a sample of 21 bats examined in the attic on 13 October.

The frequency of injured *C. gouldii* and the estimated size of the colony are given in Fig. 1. In the October samples (n = 25) 60% of living bats had either major or minor injuries. Seven of the 15 injured bats (46.6%) had wounds to the head and/or wings severe enough to impair foraging efficiency. Weight losses of 7.1% and 14.5% occurred in

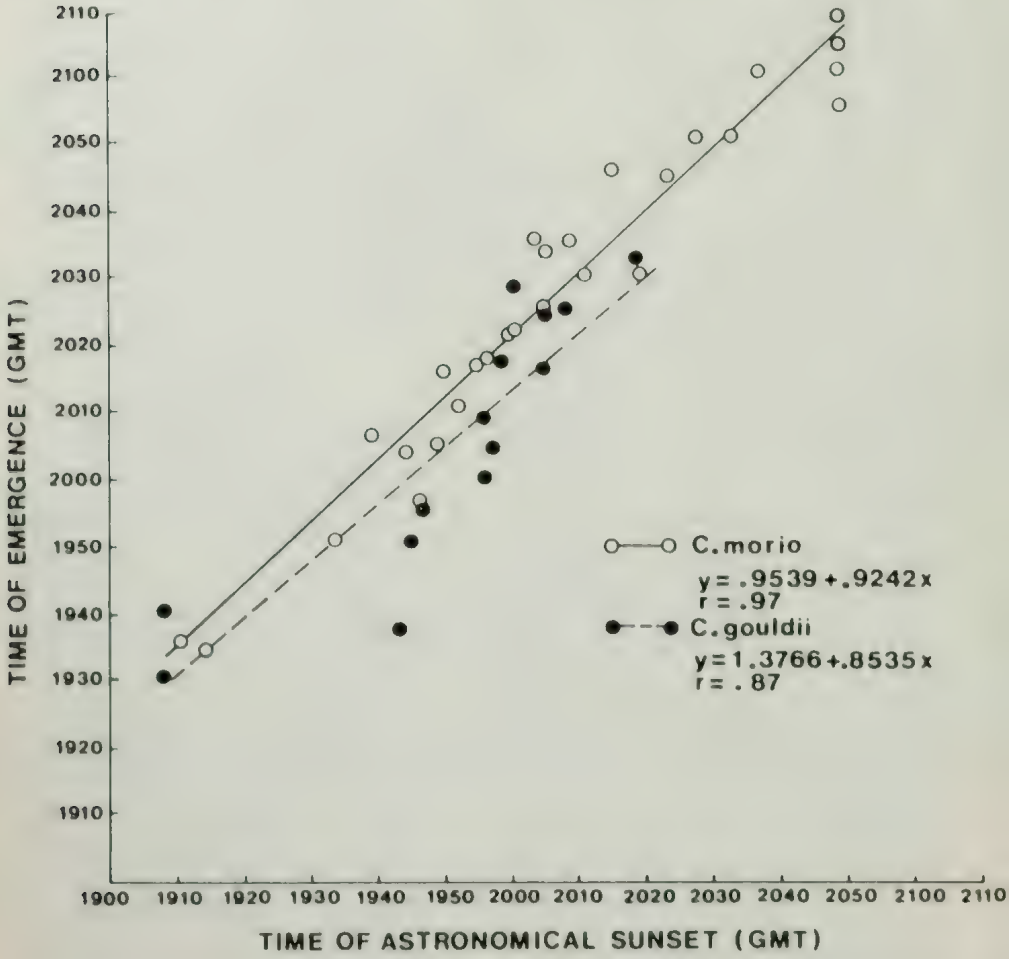

Fig. 2. Correlation between time of emergence from the roost and astronomical sunset for *Chalinolobus morio* and *C. gouldii*. Times are Greenwich Mean Time (GMT). Regression equations and correlation coefficients (r) for each species are also shown.

two banded adult females which received major injuries between 19 September and 13 October. During the same recapture interval, two uninjured adult females increased in weight by 3.6% and 5.5%. Severely infected wounds occurred in 53% of bats with major injuries. During the study of *C. morio* over 1,000 adults and fledgling juveniles were examined, but only 20 bats were observed with injuries (4 major and 16 minor).

During September and October seven dead adults (6 females and 1 male) and two (severely injured) moribund *C. gouldii* were found in the attic; all these bats were banded prior to September. One of the dead bats had a broken forearm, but the injury status of the other dead bats could not be assessed accurately due to decomposition. During the previous 7 months, only eight dead adult bats were found in the attic.

The rapid population decline of *C. gouldii* during October (Fig. 1) was probably caused by two factors: consumption and mutilation by diurnal predators and dispersal to other roosts. Disturbances during sampling within the attic may have caused some bats to leave the roost. However, the colony did not increase after regular sampling was discontinued in October 1975. Only seven bats were subsequently recorded in the attic during four summer observation periods between December 1975 and February 1978.

Although no light intensity measurements were recorded at the roosts, it was apparent that *C. gouldii* commenced foraging at higher light intensities than *C. morio*. The relationship between emergence time of the first bats and astronomical sunset is shown in Fig. 2. Emergence time was highly correlated with astronomical sunset in *C. morio* ($r = 0.97$) and in *C. gouldii* ($r = 0.87$). The mean time (±SE) of emergence of the first bats after sunset was 14 ± 2.7 min ($n = 14$) and 21 ±1.1 min ($n = 28$) for *C. gouldii* and *C. morio* respectively. This difference in emergence time was significant (Student's t-test = 2.376, $P<0.05$). In addition to emerging earlier than *C. morio*, *C. gouldii* occupied a roost where apparent sunset was nearly concurrent with astronomical sunset, resulting in a high light intensity at the time of emergence. At the roost of *C. morio*, apparent sunset occurred about 30 minutes prior to astronomical sunset. During cloudy conditions (>50% cloud cover), *C. morio* emerged 19 ± 1.6 min ($n = 11$) after sunset, compared with 21 ± 1.5 min ($n = 17$) during clear conditions. These differences in emergence time were not significant ($t = 0.96$, $P>0.05$). Insufficient observations during clouding weather prevented a similar comparison for *C. gouldii*.

Discussion

Vulnerability of bats to diurnal avian predators depends primarily on light intensity at the time of emergence. Most insectivorous bats emerge prior to dark and are easily caught by diurnal birds (Allen, 1939; Baker, 1962; Black, 1976; Black, et. al., 1979). In contrast, nocturnal owls are generally inefficient predators of bats (Dwyer, 1966; Morton, 1975; Morton, et. al., 1977; Morton and Martin, 1979). The reasons why bats emerge prior to dark and risk predation by diurnal birds are not fully understood.

Available evidence suggests that timing of feeding activity in bats and many other animals is controlled by complex interactions between an internal rhythm (circadian system) and external cues such as, light intensity, temperature, weather, and prey abundance (Herreid and Davis, 1966; Kunz, 1974; Curio, 1976, Bay, 1978; Funakoshi and Uchida, 1980). Light intensity is the main external cue controlling emergence time (Gould, 1961; Herreid and Davis, 1966).

Several other studies have shown that emergence time of insectivorous bats was closely synchronized with astronomical sunset despite light intensity variations due to local topography at roosts (Dwyer, 1964; Herreid and Davis, 1966). Perhaps arousal from daily sleep and the readiness to forage is controlled by a circadian rhythm synchronized to astronomical sunset, with a minimum

threshold light intensity acting as a flight stimulus. The intensity of this threshold light stimulus varies with different species. Some bats such as, *Chalinolobus gouldii* respond to relatively high light intensities. Light intensity at the time of astronomical sunset will influence the risk of predation by diurnal predators. Therefore, roost site selection is an important factor affecting the vulnerability of bats to diurnal predators. The risk of predation during emergence would be reduced at roosts located in terrain where light intensity attenuates rapidly prior to astronomical sunset.

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Monotoca rotundifolia J.H. Willis (Epacridaceae) Discovered in Southern New South Wales

Monotoca rotundifolia is a small prostrate or ascending inconspicuous shrub up to 0.3m high typically with distinctive rotund leaves 3-6mm long (which often appear saddle-shaped because of the recurved lateral margins), solitary axillary flowers, and petals with conspicuously papillose inner surfaces. J.H. Willis based his description of the species, Muelleria 1 (3): 141 (1967), on specimens collected by K.C. Rogers early in 1964 in montane mallee heath growing on poor slaty ground at Brumby Point (overlooking the Reedy River gorge), 1250m alt., N.E. Nunniong Plateau (±37° 03'S, 148° 06'E), East Gippsland, Victoria. As the only subsequent collections of *M. rotundifolia* also came from the type locality on the Nunniong Plateau the species has always been considered to be extremely localised in its distribution and endemic in Victoria.

It was therefore of considerable interest to receive at the National Herbarium of Victoria material of *M. rotundifolia* from I. Garven, Geography Department, School of General Studies, Australian National University, Canberra, collected on 26 May 1980 at Big Badja Hill (36° 02'S, 149° 33'E), 1360m. alt, southern New South Wales, and to be informed that the species was also seen but not collected at Wadbilliga Trig., Kybeyan Range (36° 20'S, 149° 36'E). The occurrence of *M. rotundifolia* in southern New South Wales significantly extends the known distributional range of the species and a search of the intervening high ground between the Victorian and New South Wales populations may well yield additional records of the species.

J.H. Ross
National Herbarium of Victoria
Birdwood Avenue
South Yarra, 3141.

Extension of the New South Wales Range of the White-footed Dunnart

(Sminthopsis leucopus Gray)

By D. H. King*

Introduction

Sminthopsis leucopus was originally described as *Phascogale leucopus* by Gray (1842) from a young adult male collected in Tasmania. Two males, described as *Antechinus ferruginifrons*, were later collected in New South Wales (Gould 1854), but the precise location of those collections remains in doubt (Tate 1947; Troughton 1964). The type and the New South Wales specimens were subsequently referred to *Sminthopsis* by Thomas (1888).

The absence of published records of *S. leucopus* for New South Wales since 1854 led Archer (1979) to record its extinction in that State. However, the recent examination by Morton, Wainer and Thwaites (1980) of the collections of 6 Australian museums confirmed the presence of *S. leucopus* in coastal New South Wales; extending its northern distribution to 36°S.

A new record

Six males and two females were captured by the author on the Jervis Bay Peninsula on the south coast of New South Wales during a study extending over 2544 trap nights between 12 March and 18 August 1978. The animals were caught in Elliot traps baited with peanut butter and rolled oats on two 1.4 hectare rectangular grids adjacent to Wreck Bay Road at map references 35°09'40" S., 150°42'00" E. and 35°09' 25" S., 150°42'20" E. (Fig. 1).

Habitat

The study area is floristically complex heathland dominated by the heath leaved banksia *(Banksia ericifolia)*, the stunted she-oak *(Casuarina distyla)* and the broom tea-tree *(Leptospermum scoparium)* to 1.0 m tall. Dagger hakea *(Hakea teretifolia)* is also prominent in some areas. Many low woody heath plants, herbs and grasses comprise the understorey which appears to vary in density with the soil depth and drainage characteristics (Ingwersen 1976). Immature grass trees *(Xanthorrhoea spp.)* to 0.5 m tall are scattered throughout the heath. Small mallee-form scrubby gum *(Eucalyptus stricta)* and red bloodwood *(E. gummifera)* to about 4.0 m tall, with a stem diameter of about 50 mm, form small clumps amongst the heath plants. The tall shrubs are generally absent under the mallee canopies, but herbs proliferate in these positions and a deep litter of leaves and twigs, containing extensive small mammal runways, has accumulated under most clumps. A few mature red honeysuckle *(Banksia serrata)* are present. The thin sandy soil overlies an undulating sandstone foundation which breaks the surface in some areas, forming flat sheets to 5.0 m diameter. The whole study area was burnt in a moderately hot fire in December 1972 (Ingwersen 1976), and many charred *B. ericifolia* stems and some *Xanthorrhoea* spp. stumps to 200 mm diameter remain as structural components of the regenerating heath.

The small mammals

Five small terrestrial mammal species were trapped in small numbers: (in decreasing order of density) an undescribed *Antechinus* sp. (King, in preparation); the Swamp Rat *(Rattus lutreolus)*; the House Mouse *(Mus*

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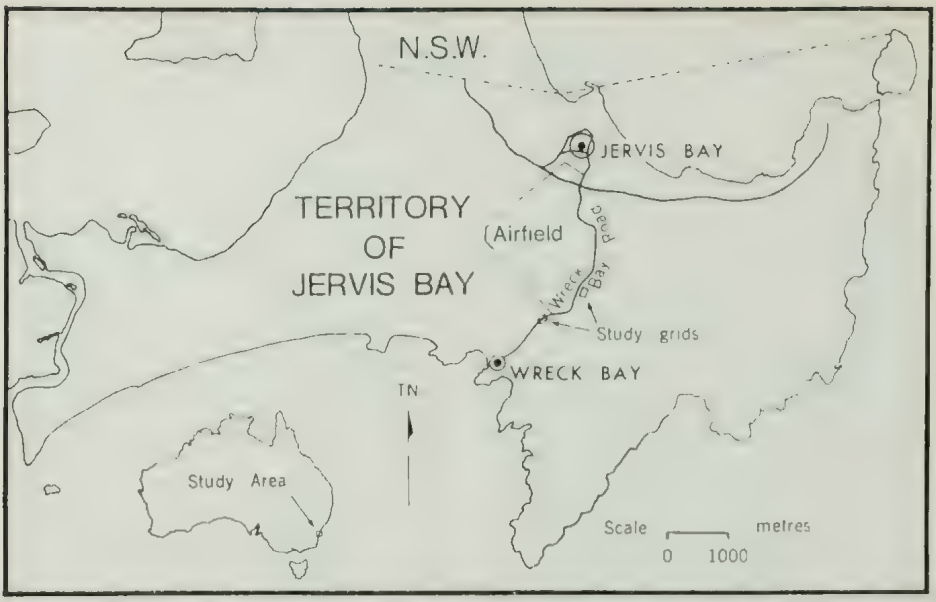

Fig. 1 Location of Jervis Bay study sites.

musculus); the White-footed Dunnart *(S. leucopus)* and; the Bush Rat *(R. fuscipes).*

S. leucopus was trapped on every visit to the area after March, and one male (No. 2) was apparently resident between June and August (Table 1). One female was caught at the edge of the understorey of a mature *B. serrata* 10 m from the road edge. All other captures were between 30 m and 110 m from the road at sites with poor cover. Three individuals were trapped at one site on the edge of a large exposed sandstone sheet. *S. leucopus* was not trapped at sites of good cover, whereas the *Antechinus* and *R. lutreolus* were frequently caught there.

Discussion

This new record extends the northern distribution of *S. leucopus* in New South Wales to latitude 35°S. However, a recent record (M. Archer, pers. comm.) from Mt. Spec, Queensland (18°57'S), suggests that the true mainland distribution spans much of the eastern and south-eastern coastal region.

The presence of *S. leucopus* on the Jervis Bay Peninsula in 6 year old heath suggests that it should be found in similar habitat elsewhere on the south coast of New South Wales. Recent extensive surveys of the mammal fauna of the south coast between latitudes 35°S and 37°30'S, however, have failed to record *S. leucopus* (Newsome, McIlroy, Catling 1975; Tidemann 1978; Coyne, Hinchey, Jenkins 1979). Its apparent absence may be an artefact, either of limited trapping effort in the appropriate areas, or of its exclusion from traps by other species. *S. leucopus* may only occupy (or be trappable in) habitat in coastal New South Wales which is marginal for competitor species. The habitat in the study area is apparently sub-optimal for other species sympatric with *S. leucopus,* as total trapping success in the heath never exceeded 13%, but was usually more than 30% in nearby wet and dry forests (King, unpublished data). No *S. leucopus* were trapped in the forest.

Table 1. Captures of *S. leucopus* at Jervis Bay, 1978.

Animal No.	Sex	Body wt (g)	April		June			July			August			
			23	24	9	10	11	16	17	18	15	16	17	18
1	♂	28	x											
2	♂	25-31			x							x	x	x
3	♂	34									x			
4	♀	17										x	x	
5	♂	26											x	
2182*	♀	15			x									
2174*	♂	24			x									
2176*	♂	31						x						

* Skulls and skins in the Australian National University Zoology Department collection.

Acknowledgements

My thanks are extended to Mr C. R. Tidemann and Dr J. L. Carstairs for their help and encouragement, and to Dr M. Archer and Dr J. H. Calaby for helpful discussions.

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Erratum

The index to Vol. 96 of the Victorian Naturalist was compiled by Arthur Theis, not James A. Baines, as stated.

Aragonite from Melbourne

By A. W. Beasley †

The opportunities to collect mineral specimens from rock exposures in our Australian capital cities are now almost non-existent. However, in the past this was not so. Many beautiful specimens of minerals were collected in earlier times from quarries and other excavations in some of our capital cities, especially in Melbourne.

An appreciable part of Melbourne lies on basalt, the most common volcanic rock. Quarrying operations in Melbourne began soon after white settlement. During last century, and even in the early part of the present century, there were quite large basalt quarries in some of the inner suburbs of Melbourne, such as Clifton Hill, Richmond and Burnley. Beautiful crystallised specimens of the carbonate mineral, aragonite, and also zeolite minerals were collected from the basalt quarries in these suburbs in former times. They were found in cavities in the basalt, and were sought after by mineral enthusiasts and quarry workers. Unfortunately, these old quarries are no longer available for mineral collecting; most have been filled with rubbish by municipal authorities.

Basalt is a hard, fine-grained rock but, fortunately for mineral collectors, it sometimes contains cavities in which striking crystallised minerals may be found. Most of the cavities were formed by the expansion of gases (mainly steam) escaping from solution as the lava solidified on cooling, but some were formed from other causes. The cavities generally are most abundant near the top of the old lava flows, but sometimes are relatively abundant near the bottom of individual flows.

During the final stages of solidification of the lava, many of the cavities were filled with mineralised aqueous solutions that circulated through the basaltic mass. At a later time, some of the cavities in the rock were filled with percolating groundwater that contained dissolved mineral matter. It is from these solutions that the various minerals were deposited in the basalt cavities.

Aragonite is, in my opinion, the most spectacular mineral found in the basalt formerly quarried in the inner suburbs of Melbourne. It commonly occurs in the cavities as radiating groups of acicular (needle-shaped) crystals, and these groups are objects of great beauty. It seems that crystallisation began from various points or nuclei and the needle-like crystals grew outwards, often forming beautiful rosettes and sheaves.

Aragonite has the same chemical composition as calcite, namely calcium carbonate, but it has a different crystal structure and different physical properties. Aragonite crystallises in the orthorhombic system, and a common crystal habit is acicular pyramidal, consisting of a long slender vertical prism terminated by a combination of a very steep dipyramid and first-order prism. According to Deer, Howie and Zussman (1966), the crystallisation of aragonite is favoured in general by temperatures of 50 degrees to 80 degrees C. Experiments by geochemists have shown that carbonated waters containing calcium more often deposit aragonite when they are hot and calcite when they are cold.

Many good specimens of aragonite were collected in Melbourne in the past, particularly from the Corporation Quarry at Clifton Hill, Chamber's Quarry at Richmond, and a fairly large quarry at Burnley. It can be presumed that the calcium in the lime-rich solutions from which the aragonite was precipitated was leached from the plagioclase feldspar and pyroxene that compose much of the basalt.

The Corporation Quarry, located at the end of Ramsden Street, Clifton Hill, just adjoining the Merri Creek, was particularly large. According to Mitchell (1942), Melbourne Council authorities worked this quarry for over 70 years, and nearly 40 metres of basalt was ex-

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Fig. 1. Aragonite (magnified) from Clifton Hill, a Melbourne suburb.

posed in the deepest part of the quarry. Pritchard (1910) states that what was then known as the Melbourne Corporation began taking stone for road metal and other purposes from this locality in 1855, whilst quarrying there is known as far back as 1846. The location of the former quarries in Richmond and Burnley is shown on the geological map of Melbourne which accompanies the publication "Geology of the Melbourne District, Victoria" by Bell, Bowen, et al. (1967). Pritchard (1944) records the fact that the largest of the Burnley quarries, known as Willis' Quarry, ceased operations only a few years before 1944.

Usually the aragonite is colourless or white, but it also varies in colour from yellow to brown due to traces of iron oxide as an impurity. Globular or mammillary calcite lines some of the cavities in which aragonite occurs, and zeolite minerals such as phacolite (a variety of chabazite) and phillipsite also are sometimes present.

Fortunately, a reasonably large number of aragonite specimens from the old quarries in Melbourne are held in the safe keeping of the National Museum of Victoria. They were collected by such men as the late S.R. Mitchell and Dr. G. B. Pritchard, both prominent in Field Naturalists Club circles. Some of the men who worked in the basalt quarries appreciated the beauty of the minerals and made private collections of choice specimens. One such person was the late Felix Westwood of Footscray who donated specimens to the National Museum of Victoria as early as 1907. Following his death, the executrix of his Will contacted me at the Museum about what she should do with his collection of mineral specimens. An inspection of the collection revealed that it contained some particularly fine

specimens of acicular aragonite as well as zeolites and other minerals from the old basalt quarries. I was successful in persuading her to donate the collection of 420 specimens to the National Museum of Victoria.

It is good to pause and really look at crystallised specimens of minerals. Groups of delicate, needle-like crystals of aragonite can be objects of quite outstanding beauty. The contrast between the slender colourless or pale-coloured crystals and the dense, very dark-coloured rock in which they are found, enhances the aesthetic appeal.

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Female Teal Calls the Tune

Recently, during the height of the duck shooting season, I was down at Werribee Sewerage Farm and made the following observation. On walking along the edge of a settling pond opposite South Spit a pair of Chestnut Teal (*Anas castanea*) swam slowly out from the edge of the pond toward the centre. All the time eyeing me warily, but making no sound and showing no signs of wing shuffling, which ducks often do when nervous. When only about fifty metres away from the observer, the male decided he had had enough and started to take off. However, when about six inches off the water surface, the female, showing no signs of taking-off, uttered a sharp hissing sound ("ts-suck . . . ts-suck"). Immediately on the sound being uttered the male aborted take-off (although already off the actual water surface) and flopped back into the water. Then joining the female, both swam away from me, toward the other side of the settling pond, eyeing me all the time.

This behaviour of the female teal (who did not appear injured) seemed very strange, for normally teal fly off very quickly at the sign of the human intruder. A possibility is that she was able to recognise the shape of a rifle or shotgun, saw I was not carrying one, therefore took the risk of remaining in the water. Also, there were shooters nearby, and the probability of one of the two ducks being shot in flight would be much greater than if in a large flock (maybe the female was able to see this?). Certainly whatever the reason, the female teal appeared to be the "boss". I wonder if anyone else has observed such behaviour in any species of duck?

M. Schuk

"Tasmanian Bird Atlas"

by David Thomas. 215 x 152mm, 171 pp including figures, tables and maps. University of Tasmania, Hobart, 1979. $A3.50 plus postage (from The Fauna Office of Tasmania, Box 252C, G.P.O., Hobart, Tasmania 7001).

Tasmania is the third Australian State to produce a bird atlas. South Australia led the way in 1977 with, *A Bird Atlas of the Adelaide region*, published by the South Australian Ornithological Association. Victoria followed in 1978 with, *A Bird Atlas of the Melbourne Region*, by Helen I. Aston and Rosemary Balmford, and published by the Victorian Ornithological Research Group. The *Tasmanian Bird Atlas* differs in that it covers the entire State — the only State ". . . with clearly defined bio-geographic boundaries." Now that the Royal Australasian Ornithologists Union's, *Atlas of Australian Birds* is well under way, all of these publications are important for many and obvious reasons. Many bird-watchers maintain distribution maps of their own, so this pooling of knowledge adds to our ornithological store. Participants become trained as field recorders, modifications and improvements are studied and problems are ironed out. All of this is very valuable experience if steps are to be taken towards the preservation of our bird life.

The atlas under review started out as a personal venture by the author, but as the project progressed other local bird-watchers made their records available. Ninety percent of the records are based

on observations made since 1960, with the remaining ten percent extracted from literature. With one exception, distribution maps are given for all species recorded from more than ten grid blocks. These maps are based on ten minute grid blocks. This results in 138 maps. The exception is the Clamorous Reed Warbler *Acrocephalus stentoreus*. This species is included " . . . because it is known to breed regularly but has a very restricted distribution", which, I suppose, is as good a reason as any. A further 94 species are listed at the back of the book. It is a pity that these were not also placed on the maps, perhaps using a small rectangle to indicate their distribution. Pelagic birds are not included.

Due to lack of space, information relevant to each mapped species is conveyed in the accepted abbreviated form — a letter or a series of letters — 41 altogether. This tends to make the bottom of the page of some species such as the Forest Raven (p159), Grey Fantail (p122) or Black-faced Cuckoo Shrike (p111) appear to be carrying a coded message intended to confuse the enemy. However, perseverance divulges a surprising amount of information, as do the few additional comments which conclude the notes for most species.

Although comparisons are odious, in this case they are inevitable, and with each succeeding atlas one seeks improvements and innovations. Here, included between pages 98 and 99, are two readily detachable maps. One gives Tasmanian vegetation zones and the other, effective rainfall zones. Another worthwhile addition on each page is an inset map, indicating the mainland range of each species.

Regretfully, there is no map with place names listed. To Australians, detailed maps are readily available, but this omission could prove a distinct handicap to anyone working in another part of the world. Perhaps this can be remedied in a future edition.

Because maps portray distribution so much more vividly than words, this atlas is welcomed. The book is of a convenient size, nicely presented and an important addition to our ornithological literature, a foundation to be built upon as our knowledge of distribution is extended.

(Mrs) Tess Kroon

Field Naturalists Club of Victoria

Reports of recent activities

Centenary Expedition November 1-8, 1980

The centenary expedition of the F.N.C.V. was based at Wilson's Promontory, a most suitable venue as the F.N.C.V. had played an important part in establishing the Promontory as a national park the first in Victoria.

About 160 people attended; some camped in tents or caravans and others stayed in the comfortable cabins provided at Tidal River.

Day excursions were arranged to a number of places including Lilly Pilly Gully, Tongue Point, Chinaman's Creek and Corner Inlet, whilst some members walked to Sealer's Cove, the light house or Waterloo Bay.

The Tongue Point walk was of considerable interest as 12 orchid species were found. Members watched a sea eagle, and Dr Willis with a few naturalists crossed to the island just off the point and found bushes of the crimson berry *(Cyathodes juniperina)* in fruit. A few bushes were also found on the mainland. The walk ended at Derby River.

In Lilly Pilly Gully many lilly pillys had grown or regenerated since the last bush fires, and a pair of spotted pardoletes gave great pleasure as they fed their young in a hole in a bank quite unconcerned by watching naturalists.

A highly successful trip was made, with the help of the rangers, to Chinaman's Creek. The very rare slender tree fern *(Cyathea cunninghamii)* was found there, including a specimen 40 feet high; also two plants of the oval wedge fern *(Lindsaea trichomanoides)*. This is the only place in Victoria where the latter has been found.

We met each evening to hear lectures given by Dr Willis and the Rangers, Peter Thomas and Malcolm Turner and to exchange nature notes. One evening the District Supervisor Bob Jones came to speak on Park Management. In the mornings we were fortunate to see some of the animals caught by the Mammal Survey Group. It was very interesting to see one of the four poteroo species captured. These animals were later released.

Our thanks go to the rangers who helped make this such an interesting and enjoyable expedition.

Full details will be published in a later issue.

General Meeting
Monday 13 October

Representatives of the Geology, Botany and Mammal Survey Groups spoke on aspects of Wilson's Promontory.

Mr Tom Sault stated that The Prom is one granite mass where sedimentary deposits have been mostly worn away and the exposed granite weathered to rounded shapes. Miss Pat Carolyn showed colour slides of vegetation of various parts. Mr Malcolm Turner spoke of six distinct habitats in The Prom and of some of the animals peculiar to such habitats.

Some maps would have been appreciated.

General Meeting
Monday 10 November

Professor Stubbs, President of the Royal Society, presented the 1980 Natural History Medallion to Mr Michael Tyler and spoke of Mr Tyler's work with frogs and his wide activities for conservation.

Speaker for the evening, Mr Tyler, told us of the great increase of knowledge of Australian frogs during the last 20 years. In 1961 there were 91 known species, in 1980 160, and he suspects there could be up to 250 Australian species.

Mr Tyler showed colour slides of frogs ranging in size from 3mm to 130mm, frogs in astonishing variety of colour and form, from dry areas and wet areas, burrowers and tree-dwellers, and some with very curious habits. In one species, the male houses the tadpoles in a pocket in the thigh; in another, the female swallows the tadpoles, releasing them when frogs, and herself not feeding during those 40 odd days. It was a wholly fascinating address.

Before the meeting, Prof Stubbs and Mr Tyler were dinner guests of FNVC Council at Domain Hotel accompanied by other members and previous Medallionists.

More Activity Needed from Naturalists for Conservation

LCC Study Area Reports. The Land Conservation Council receives far fewer submissions from naturalists re their Study areas than it receives from developers. Therefore, developers have the edge over conservationists.

Any person who knows of any rare, interesting or restricted species (flora or fauna) should submit his observations to the LCC or, if you prefer, to FNCV Council to handle the submission for you.

Reports by Mr Cliff Beauglehole following the LCC Study Area Reports bring attention to particular aspects or to deficiencies in the LCC report. Buy the Beauglehole reports ($5 apiece), study them and write to LCC (or FNCV) emphasising the aspects you think are most necessary for conservation. The reports are "Distribution and Conservation of Native Vascular Plants in the Victorian Mallee 1979" and similarly " . . . in the Corangamite-Otway area Victoria 1980", both with large fold-out maps.

Vascular Plant Checklists for various areas in Victoria are being produced by Mr Beauglehole at considerable effort and cost. If the checklists are not sold in sufficient quantity ($6 apiece) the work will have to stop and both science and conservation will be the losers. Buy the various area lists as they become available.

More submissions to LCC, more money — they are the essential tools to work for conservation in Victoria. FNCV members and other naturalists are urged to supply more of both.

The Beauglehole reports and checklists can be obtained from FNCV Sales Officer, Mr D. E. McInnes, 129 Waverley Road, East Malvern, 3135. Prices include postage in Victoria.

(Continued from page 230)

GROUP MEETINGS

All FNCV members are invited to attend any Group meeting, no extra charge.

At the National Herbarium, the Domain, South Yarra, at 8.00 p.m.

Third Wednesday — Microscopy Group

There will be no December meeting.

Wednesday, 21 January. Members' exhibits.

Wednesday, 18 February. Programme for 1981. Members' exhibits.

Second Thursday — Botany Group

Thursday, 12 February. North America — the beauty of the wild plant. Speaker: Mary Doery.

At the Conference Room, the Museum, Melbourne, at 8.00 p.m. Good parking — enter from Latrobe St.

First Monday — Marine Biology and Entomology Group

There will be no January meeting.

Monday, 2 February. Holiday observations and members' exhibits.

Monday, 2 March. Molluscs of Port Phillip Bay. Speaker: Dr Brian Smith.

GROUP EXCURSIONS

All FNCV members are invited to attend Group excursions.

Botany Group — last Saturday.

Saturday, 28 February. Mt Donna Buang.

Day Group — third Thursday

There will be no January outing.

Thursday, 19 February. Botanic Gardens: Australian border and fern gully. Meet at the corner of Domain Rd and Park St at 11.30 a.m. Leader: A. Fairhall 578-2009.

Thursday, 19 March. Train outing to Fern Tree Gully National Park. Train to Upper Fern Tree Gully from Flinders St at 10.15 a.m. Leader: I. Gillespie 578-1879.

There will be no April outing.

Mammal Survey Group

Friday, 26 December, continuing for 7-10 days. Camp, high plains in East Gippsland.

Saturday, 24 — Monday, 26 January. Australia Day weekend. Gelliondale.

Centenary Nature Show
Lower Melbourne Town Hall
Fri-Sun, 10, 11, 12 October

The Show included a great variety of displays, some of them being contributed by affiliated clubs.

One of the most impressive was by our Mammal Survey Group. Sundry stuffed animals were set amongst trees and undergrowth and gliders were suspended in mid-air. With the lamps provided, visitors could do some spotlighting themselves and were shown how the various traps are used. A take-away leaflet provided information about the animals displayed.

Hawthorn Juniors showed methods of preserving and mounting insects and fossils, and a great attraction was the pond where visitors could fish up small pond-life with the handnet and then examine their finds under a low-power microscope.

Montmorency Club had a substantial timber bird-hide behind which were various stuffed birds in a natural setting with painted backdrop. Visitors peeped at the unsuspecting birds through a slit in the wall — one slit at child eye-level, another at adult level.

With an appropriately painted background, Black Rock Club had a coastal exhibit with tanks of marine creatures and other coastal life with showcards and diagrams.

There was a display of 'Common Native Plants — from coast to the hills' with colour posters behind of the different areas — coastal heathland, Dandenong foothills, forest and fern gully.

A series of glass cases of labelled rocks and fossils told the story of the earth's formation through the ages.

Many microscopes had an extraordinary variety of objects for examination, and there was a continuous small movie of pond life.

There were displays of various gall insects and the strange growths they produce, cases of butterflies, photos etc of excursions by the Day Group, talks and demonstrations on plant propagation which attracted keen gardeners, a table on FNCV history and activities, a table for sale of publications, Centenary T-shirts and other merchandise, and a rug made from wool dyed with different eucalypt leaf extracts.

And there were masses of wildflowers — all home-grown of course. They were on several large circular tables and provided attractive colour throughout the hall. One table exhibited plants especially attractive to birds. The flowers were provided by members of several clubs.

Costs exceeded takings, but the purpose of the Show was to make the public more aware of the FNCV and to get more people more interested in natural history. Thanks go to all members who put in so much work to achieve that purpose. Special thanks go to Miss Marie Allender as convenor of the organising committee.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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His Excellency the Honorable SIR HENRY WINNEKE, KCMG, KCVO, OBE, KStJ, QC.

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Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

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